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CONTENTS

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BULLETIN

OF THE

BROOKLYN ENTOMOLOGICAL SOCIETY

Vol. XLVI February, 1951 No. 1

NEW AMERICAN MUSCOID DIPTERA.[1]

By H. J. Reinhard, College Station, Texas.

The following descriptions of new species are based mainly upon material collected by Messrs. F. A. Cowan and M. R. Wheeler in Mexico and western United States. I am indebted to the latter for the privilege of studying their extensive collections of Muscoid flies and to Dr. George F. Knowlton, who submitted one of the forms treated herein as indicated under the description of same. Types of the new species are in my collection.

Belvosia auratilis n. sp.

A large robust species closely allied to *borealis* Aldrich, but the male genital forceps are distinctly longer, the palpi black and the first two abdominal segments each with only one pair of median marginals.

Male: Front at vertex 0.40 of head width, gradually widening downward into facial angle; frontals in three irregular rows, median one sharply divergent in three or four bristles beneath antennal base; ocellars and orbitals absent; verticals two pairs, stout; parafrontal with gray pollen below becoming thinner and blackish towards vertex; median vitta broad, concolorous with parafrontal; face, parafacial, cheek and posterior orbit silvery white; third antennal segment black, two to two and one-half times length of second; latter usually reddish on front margin and on apex; arista shorter than antenna, brownish black; thickened and tapering to tip; vibrissae over half the length of second antennal segment above the oral margin; parafacial broad, about twice clypeal width; facial ridges with moderately strong bristles extending above the middle; cheek and upper half of parafacial black-haired; palpus stout, occa-

[1] Contribution No. 1222, Department of Entomology, Texas Agricultural Experiment Station.

sionally paler or reddish on extreme tip; back of head flat, cinereous, clothed with pale hairs.

Thorax subshining black, lightly dusted with grayish pollen above, vittae indistinct; sternopleurals usually four; scutellum with five pairs of laterals and numerous irregularly spaced discals on apical half. Legs black, stout, bristly; front pulvillus exceeding length of last tarsal segment. Wing and calypter black; costal spine vestigial; apical cell open well before wing tip; subepaulet blackish, tinged with red on inner apical margin; epaulet wholly black.

Abdomen subshining black, third and fourth segments golden pollinose on basal three-fourths or more, each with a complete marginal row of stout bristles; genitalia black; forceps subequal the length of first segment of hind tarsus, rather straight in profile with tips gently bowed forward, hind surface transversely convex and moderately clothed with long black hairs; accessory process as long as forceps and nearly as thick as latter in profile, basal half bearing numerous long, coarse hairs directed outwardly, tip broadly rounded; fifth sternite black, with a broad V-shaped median excision, inner margin of lobes beset with black hairs and bristles near base.

Female: Front at vertex 0.44 of head width; two to four proclinate and one or two reclinate orbitals; second antennal segment one-half length of third and usually more extensively reddish in ground color than in male.

Length, 17–18 mm.

Holotype male and allotype female, Guadalajara, Mich., Mexico, August 27, 1947 (F. A. Cowan and M. R. Wheeler). Paratypes: 3 males and 7 females, same data as type.

Belvosia ansata n. sp.

Differs from the preceding species chiefly as follows: Male smaller and less robust in build; front at vertex 0.40 of head width; palpus wholly red; vibrissae situated the length of second antennal segment above oral margin; facial ridges with stout bristles ascending about to level with arista; parafacial but slightly narrowed below and nearly equal to clypeal width on lower extremity, black hairs beneath frontals small and averaging less than six in number. Thorax black with thin grayish pollen anteriorly; scutellum deep reddish brown, normally with four pairs of lateral bristles and usually a short spinelike apical or preapical pair. Front claws and pulvilli elongated, almost equal to last two tarsal segments. Wing and calypter deep brownish to black; subepaulet wholly orange red. Abdominal segments three and four with golden pollen extending

to hind margin on venter but less distinctly so on sides, the upper posterior edge of each appearing blackish in direct view; second genital segment reddish on sides; forceps about half as long as first segment on hind tarsus, triangular in rear view; accessory process widest at middle, tapering apically to a narrow rounded tip, sparsely clothed with fine hairs basally on outer side.

Female: Front at vertex 0.40 of head width; one reclinate and usually three proclinate orbitals; second antennal segment slightly over one-half length of third, more or less reddish in ground color; front pulvillus a little shorter than apical tarsal segment.

Length, 14–15 mm.

Holotype male and allotype female, Guadalajara, Mich., Mexico, August 27, 1947 (F. A. Cowan and M. R. Wheeler). Paratypes: 11 males and 4 females, same data as type.

The species resembles *bifasciata* in general appearance but is readily distinguished in having the calypter black, subepaulet wholly orange red and the male genital forceps are distinctly shorter and broader. The golden pollen of the last two abdominal segments extends to the apex of each on the venter but fades out at the sides so that the very narrow hind margins of these segments above appear blackish in most views. This approaches the color pattern of *canadensis,* but in the latter species the hind lobe of the calypter is whitish and the front pulvilli in the male are small.

Belvosia matamorosa n. sp.

A moderate-sized species allied to *elusa* Aldrich, which I have not seen. From the description of the latter (Proc. U.S.N.M., 73:25) the present species differs in lacking median marginals on the first abdominal segment and the two following ones are more extensively pollinose. Additional differences are listed below.

Male: Front at vertex 0.40 of head width, diverging immediately forward into facial angle; parafrontals gray pollinose on an apparent blackish ground color; frontal vitta obscurely reddish, much narrower than parafrontal; ocellars and orbitals absent; outer verticals about one-half as long as inner pair; frontals in three irregular rows, with about three bristles beneath antennal base diverging widely on upper part of parafacials, the latter also bear a few small black hairs directly below the lowermost bristles; face, parafacial and cheek with dense satiny white pollen on yellow ground color; vibrissae about the length of second antennal segment above oral margin; facial ridge with rather stout bristles on lower three-fifths; first two antennal segments red, third mostly black and about four times length of second; arista brownish, moderately thickened to beyond

middle, thence very slender to tip; palpus stout, red, beset with numerous black hairs, haustellum short, thick, labella large and fleshy; cheek slightly over one-third eye height, clothed with fine black hairs; back of head flattened, cinereous, wholly pale-haired.

Thorax black, the posterior angles, scutellum and humerus reddish brown, thinly gray pollinose above to base of scutellum, latter subshiny but showing thin tawny pollen in a flat rear view; dorsal vittae narrow but rather well defined; sternopleurals four. Legs black; hind tibia ciliate with one larger bristle in the row; pulvilli subequal to length of last tarsal segment. Wing blackish basally and long costal margin to tip of first vein, thence paler to apex including the broad posterior margin; apical cell open well before wing tip; costal spine vestigial; veins including costa blackish; subepaulet wholly orange red, epaulet deep reddish; calypter brown.

Abdomen black, with changeable gray pollen on second segment above, which extends thinly to the hind margin when viewed in an oblique rear angle; third segment with somewhat denser pollen over entire surface above interrupted by a dark median stripe and continuing down sides becoming heavier on venter; fourth segment covered with dense pale yellow pollen to apex; last two segments each with a marginal row of bristles; genital forceps blackish, short and triangular as viewed from the rear, tips separated but not divergent; accessory process reddish, slightly shorter and thicker than forceps in profile, tip rounded; fifth sternite rather small and retracted, lobes black beset with moderately coarse black hairs along the inner basal margin.

Length, 12 mm.

Holotype male, Matamoros, Pueb., Mexico, September 8, 1947 (F. A. Cowan and M. R. Wheeler).

Belvosia villaricana n. sp.

Abdominal segments one to three subshining black and without pollen except on venter, the fourth brownish in ground color, its surface above and below covered with thin changeable pale pollen from base to apex; sternopleuron and cheek pale-haired.

Female: Front at vertex 0.33 of head width; parafrontal yellowish gray pollinose to vertex but somewhat blackish on upper half when viewed from above; frontal vitta red, narrowed toward vertex but at mid front nearly equal to the width of one parafrontal; verticals two pairs, stout; ocellars absent; one reclinate and two or three proclinate orbitals; frontals in a single row; hairs beneath lower frontal bristles pale and delicate; face including sides and cheeks pale yellowish white pollinose on yellow ground color; facial ridges

with four or five bristles and some delicate white hairs outside of latter ascending to or slightly above the middle; vibrissae nearly the length of second antennal segment above oral margin; basal antennal segments brownish red, the third black, about one and one-half times length of second; arista brown, moderately flattened but slender-tipped; palpus red, stout; cheek barely one-third eye height; beard pale yellowish white.

Thorax black, thinly gray pollinose above, hind angles and scutellum dark brown with tawny pollen; five lateral scutellars on one side and four on the other, besides a short but stout preapical pair; sternopleurals four. Legs black; coxae and front femora in part pale-haired; pulvilli hardly as long as last tarsal segment. Wing dark brown, calypter opaque blackish; costal spine vestigial; subepaulet wholly orange red, epaulet darker red.

Abdomen as mentioned above; two to three pairs of median marginals on first segment and four on second; last two segments each with a marginal row; venter mostly subshining but with some pale pollen visible along median line of the three basal segments when viewed from behind.

Length, 14 mm.

Holotype female, Villarica, Paraguay, January, 1939 (F. Schade).

Gaediophana monnula n. sp.

A moderately large black species, with the thorax thinly gray pollinose above, the wings blackish near base and the ocellar bristles uniformly absent.

Male: Front at vertex 0.32 of head width, diverging from upper fourth into facial angle; head pollen gray, thinner on parafrontal which appears blackish, but in most views the pollen extends to the vertex; frontal vitta deep red, much narrower than one parafrontal; verticals two pairs; frontal row doubled, the inner or main row strongly divergent anteriorly in three or four bristles beneath antennal base; parafacial narrower than clypeal width, black-haired on about outer third from lowest frontals to cheek groove and with a more or less differentiated median row of stronger bristly hairs; epistoma as wide as clypeus and bowed forward from plane of latter; vibrissae nearly on oral margin; facial ridges strongly ciliate to upper third or more; antenna almost as long as face, basal segments usually with a slight reddish tinge, third wholly black, about three and one-half to four times length of second; arista black, thickened on proximal three-fourths, second segment elongate, the first short; cheek hardly one-third eye height, clothed with fine black hairs; palpus yellow but at times darker or brownish basally; haustellum

subequal length of palpi, stout, labella fleshy; eyes thickly pilose; back of head flat, cinereous, thickly clothed with pale hairs.

Thorax black, the hind angles and scutellum brownish, latter with thin tawny pollen, subshiny in most views; dorsal vittae narrow but distinct. Chaetotaxy: acrostichal 3,3; dorsocentral 3,4; intraalar 3; supraalar 3; presutural 2; notopleural 3; humeral 4; sternopleural 2,2; pteropleural 1–2 (smaller than sternopleural); intrapostalar differentiated; postalar 3; scutellum with 3 strong lateral, 1 decussate smaller apical and 1 discal pair, besides numerous erect coarse bristly hairs on disc; postnotal slope bare.

Legs black; mid tibia with a row of four or five bristles on basal half of outer front side; hind tibia irregularly ciliate on outer posterior side; claws and pulvilli longer than last tarsal segment.

Wing reaching well beyond apex of abdomen, subhyaline except near base; first vein bare, third with two or three hairs near base; apical cell open far before wing tip; hind cross vein in plane of apical cross vein and joining the fourth about one-third the distance from bend to small cross vein; costal spine vestigial; epaulet and calypter black.

Abdomen subshining black with a more or less distinct reddish tinge in the ground color on sides, viewed in a flat rear angle the surface above is covered with thin lusterless tawny pollen; last three segments with long erect hairs that become coarser or bristle-like on the median area of second and third, each of which bears a pair of differentiated discals; one pair of median marginals on first two segments, a marginal row on third and fourth besides a discal row on last; genital segments small; wholly black; forceps moderately elongate and slender, tips separated but not divergent, each bearing a minute basally directed spine on outer side shortly before apex, hind margin almost straight in profile; accessory process triangular, as broad as long, polished black, with anterior margin fringed with fine black hairs; fifth sternite black, deeply excised, the lobes sparsely clothed with rather short hairs along inner margin.

Female: Front at vertex 0.33 of head width; one reclinate and two proclinate orbitals; third antennal segment about two and one-half times length of second; abdomen short, more broadly ovate and flattened above than in male; claws and pulvilli shorter than last tarsal segment.

Length, 9.5–12 mm.

Holotype male and allotype female, Rio Frio, Mex., Mexico, September 3, 1947 (F. A. Cowan and M. R. Wheeler). Paratypes: 11 males and 5 females same data as type; 16 males and 11 females,

Nochixtlan, Oax, Mexico, September 6, 1947 (F. A. Cowan and M. R. Wheeler).

Siphosturmia maltana n. sp.

Similar to the genotype (*rostrata* Coquillett) but the abdomen is almost wholly reddish in ground color; also the male front is distinctly wider and the last abdominal segment in the female is more elongated, slightly exceeding the combined length of the two preceding segments.

Male: Front at vertex 0.38 of head width, about equibroad on upper third thence widening gradually into facial angle; pollen on head wholly grayish white; frontal vitta deep red, narrower than one parafrontal; frontal rows doubled before mid front, main or inner row strongly divergent in three or four bristles beneath antennal base, uppermost two bristles stout and reclinate; ocellars and inner verticals strong; basal antennal segments red, third blackish, hardly one-third longer than second; arista black, shorter than antenna and thickened on basal two-thirds; clypeus hardly depressed, epistoma bowed forward from clypeal plane; facial ridges flattened, with a few bristles next to vibrissae, which are near oral margin; parafacial bare below frontals, one-half clypeal width on lower extremity; haustellum slender, tapering apically, slightly over one-half head height; labella slender slightly elongate; palpi yellow, bowed and but little thickened apically; eye bare; cheek barely one-fourth eye height.

Thorax black, with moderately dense gray pollen tinged with yellow on mesonotum, latter with four dark vitta before suture and five behind; acrostichal 3,3; dorsocentral 3,4; presutural 2; intra-alar 3; supraalar 3; intrapostalar differentiated; sternopleural 4; pteropleural 1–2 (smaller than sternopleural); scutellum reddish, with 3 large lateral bristles besides 1 smaller decussate apical and 1 discal pair; calypters white. Legs black; hind tibia ciliate; claws and pulvilli moderately elongate. Wings hyaline; costal spine minute; first posterior cell open far before wing tip; cubitulus obtuse angulate, without stump or fold; epaulet black.

Abdomen red with a dark median vitta, which widens gradually towards base and is more or less obscured by rather dense whitish pollen on last three segments above; one median marginal on first two segments, a row of about 10 stouter bristles on the narrow subshiny hind margin of third segment and several irregular rows on shining apical half of fourth above; genitalia small and retracted in repose; forceps shining brown, short, rather narrow from base to tip and straight in profile, divided apically but not divergent; acces-

sory process shorter, subtriangular; fifth sternite small, with a median V-shaped incision.

Female: Front at vertex 0.42 of head width, hardly any wider downward; two proclinate orbitals and outer verticals present; third antennal segment about one-fourth longer than second; arista thickened on proximal three-fourths; abdomen strongly arched in profile, last segment elongate, pointed, with numerous erect short bristles above except on basal margin; genitalia tubular, protrusile, terminating in a subchitinized blunt tip; claws nearly as long as last tarsal segment, pulvilli distinctly shorter; otherwise as in male.

Length, male, 10–11 mm.; female, 7.5–8 mm.

Holotype male and allotype female, Malta, Montana, July 26, 1947 (F. A. Cowan and M. R. Wheeler). Paratypes: 20 males and 6 females, same data as type.

Guerinia trudis n. sp.

Differs from the genotype (*simulans* Meigen) mainly in the peculiar structure of the male fifth abdominal sternite; the lobes of the latter are deeply excised near the middle of each inner margin and bear a dense vestiture of short coarse hairs at the base.

Male: Front at vertex 0.31 of head width; parafrontals and upper half of parafacials pale yellow to golden pollinose, face, including lower part of parafacials and cheeks grayish white to subsilvery; frontal vitta narrow, deep brown; frontals descending to middle of face; facial ridges weakly bristled on lower third or less; antenna wholly black, second segment about one-half length of third; arista black, thickened on basal half; palpus reddish; cheek nearly one-fifth eye height; eye bare. Thorax and scutellum black, with rather dense gray pollen which usually shows a slight brassy tinge on mesonotum; sternopleurals 3; acrostichals 3,3; dorsocentrals 3,3; scutellum with 3 lateral, 1 upturned strong apical and 1 smaller discal pair; calypter white. Legs black, moderately long; hind tibia not ciliate; front pulvillus subequal to combined length of two apical segments. Wings subhyaline; first posterior cell narrowly open far before wing tip; fourth vein with a wrinkle or fold at bend, latter subrectangular; last section of fifth vein a little less than one-half length of preceding; costal spine small. Abdomen long ovate, black with a distinct reddish tinge in ground color on sides and venter, segments two to four gray pollinose on basal half or more; intermediate segments usually without discals; first segment with one and second generally with two median marginals; third segment with a marginal row of about ten and fourth bristly on apical half above; genital segments rather small and retracted within tip of

abdomen; forceps united, broadly ovate at base tapering distally to a slender, acute beak; hind surface of base concave and thickly clothed with bright yellowish hairs; fifth sternite as mentioned above, the fourth thickly beset with bristly black hairs.

Female: Front at vertex 0.35 of head width; pollen on head at times wholly gray but parafrontals usually more or less golden; two proclinate orbitals and outer verticals well developed; second antennal segment fully two-thirds length of third, sometimes slightly reddish at apex; claws and pulvilli shorter than apical tarsal segment; otherwise, similar to male.

Length, 6–10 mm.

Holotype male and allotype female, Panguitch, Utah, June 15, 1948 (G. F. Knowlton and S. L. Wood). Paratypes: 10 males and 9 females, same data as type; 1 male, "Idaho, Aug. 10, '19"; and 1 male, Long Valley, Alpha, Ida., June 24, 1934 (Chas. H. Martin). In the California Academy of Sciences Collection, 5 males and 2 females, Yosemite, Cal., 3880–4000 ft., June 12–17, 1931, without collector's label, and 2 males, Hallelujah Jct., Lassen County, California, July 4, 1949 (J. W. MacSwain).

Unusual Cockroach: During 1942, the brown banded cockroach, *Supella supellectilium* (Serv.) was found to be infesting a home at Logan, Utah. The previous renter in this house had moved up from Texas, a year or so before, evidently bringing this pest along. Roaches which were sent in from a home at Payson, Utah, during August of 1943, were identified by Dr. H. K. Townes as belonging to this same species. Other specimens of this brown banded species also were called to my attention; these had been collected in Salt Lake City during 1945. Fortunately, this active species has not, as yet, become one of our "common" household pests.—G. F. Knowlton, Logan, Utah.

SOME NOMENCLATORIAL NOTES ON PSYCHODIDAE (DIPTERA).[1]

By G. B. Fairchild, Ancon, Canal Zone.

In connection with taxonomic work on *Phlebotomus* it was found necessary to consult a series of recent papers by Rapp, Rapp and Cooper (1944–1946) and Enderlein (1935–1937), dealing with the family *Psychodidae.* Rapp's papers consist of a list of genera, with genotypes, for the world and check lists of the species of the world by zoogeographical regions. The generic list is compiled largely from Enderlein (1935, 1937), with some additions. Enderlein's final paper, the only one available to me, is a generic revision of the whole family *Psychodidae,* with keys and descriptions of many new genera. The following additions and corrections should be noted, though by no means all names have been carefully checked.

Phlebotomiella Meunier, 1906, Le Naturaliste (2)20 (Annee 28) : 103. Monotypic for *Phlebotomus tipuliformis* Meun. 1905 (Ann. Mus. Nat. Hungarici 3 : 254, Pl. VI figs. 14, 15, 16). Fossil in Baltic amber. The original description and figures show an insect with wings reminiscent of *Phlebotomus,* the radius pectinately branched, but forks of R_2 and R_3 very close together and far distal on the wing. In terms of Phlebotometry, alpha and beta together are much less than gamma, while delta is a minus quantity. The antennae are *Phlebotomus*-like with a long third segment. The palpi are shown as 4 segmented, the terminal segment short. I believe either that the first segment was overlooked or the true terminal or fifth segment was lost at the time of preservation. The proboscis, although described as protruding, hardly seems sufficiently developed as shown in the figure to have belonged to a haematophagous insect. The male genitalia, although not very clearly described or figured, seem to have been quite similar to *Phlebotomus,* apparently with two terminal and a median spine on the style, terminal spines on the lateral lobes and protuberant structures of some sort on the inner aspect of the coxites. Annandale (1910) mentions the genus and doubts its distinctness from *Phlebotomus.* The name appears to have been overlooked by subsequent students of the family.

Phlebotomus Rondani 1840. The spelling of this name is still a point of contention. Loew as long ago as 1845 (Dipt. Beitr. I.) said that "the name must be Latinized but not Italianized" and changed

[1] Paper No. 2570 of the Scientific Journal Series, Agricultural Experiment Station, St. Paul, Minnesota.

the spelling from *Flebotomus* to *Phlebotomus.* As has been noted by others (Rapp 1944, Brues 1944) Rondani himself was thoroughly inconsistent in his spelling, using *Hebotomus* and *Phloebotomus* as well as *Phlebotomus* and *Flebotomus.* His spelling of other names appears to have been equally erratic, as in 1856 (Dipt. Italicae *Prodr.* 1 p. 178) *Psychoda phalaenoides* is written *Psicoda falenoides.* It is the writer's opinion that *Phlebotomus* is the preferable orthography, even should it be necessary to suspend the rules to accomplish this.

A number of names have been placed as synonyms or subgenera of *Phlebotomus* and since there is, at present, a tendency to split the genus into an increasing number of groups, it may be well to list the available names and synonyms here.

Philaematus Loew 1845, Dipt. Beitr. 1, pp. 8–9, figs. 14, 15. Monotypic for *P. pungens* Loew. Fossil in Copal. From the figures this is a species of *Phlebotomus.* Loew's remarks lead one to suppose that the specimens, a male and a female, are very well preserved, and that an examination of the genitalia and other structures now used for classification might enable the species to be associated with some recent subgenus. It is possible that Meunier (1905, Rev. Sci. Borbonnais, 204–209) has placed *pungens* in *Phlebotomus,* but I have not seen this paper.

Cyniphes Costa 1843. Ann. Acad. Aspir. Natural. 1: 4. With *molestus* Costa. The name is generally listed as a synonym of *P. papatasi,* but I have not seen the original publication.

Haemasson Loew 1844, Stett. Ent. Zeit., 5: 115, with *H. minutus* Lw. The insect is recognizably figured, and is without doubt a synonym of *P. papatasi,* where it has been placed for many years.

Eophlebotomus Cockerell 1920, Ann. Mag. Nat. Hist. (9), 6, 212 fig. *E. connectens* Cock. sole species. Fossil in Burmese amber. Enderlein (1937) lists this as a full genus in the Tribe *Mormiini* on p. 98 and also, as *Euphlebotomus,* as a subgenus of *Phlebotomus* on p. 109. I do not believe it is especially closely related to *Phlebotomus,* and it is certainly not a subgenus. From the available descriptions and figures, it seems to stand between the *Trichomyiinae* and *Phlebotominae,* but we know too little of its structure as yet.

Lutzomyia Franca 1924, J. Sci. Mat. Phys. Nat. Lisboa (3) 17: 10. Nom. nov. pro *Lutzia* Franca 1920, nec Theobald 1903. The type of *Lutzia* Franca was *Phlebotomus longipalpis* Lutz, hence the new name takes the same type, not *argentipes* Annan. as Rapp (1945) suggests. *Lutziola* Strand 1932, *Lutziomyia* Cordero, Vogelsang and Cossio 1928 and *Fransaia* Dyar and Tovar 1926,

were also proposed as substitute names for *Lutzia* Franca and hence take the same type.

Shannonomyina Pratt 1947, Proc. Ent. Soc. Washington 49: 86. Nom. nov. pro *Shannonomyia* Dyar 1929 (July), nec *Shannonomyia* Alexander 1929 (January) (Tipulidae). Type *Phlebotomus panamensis* Shannon.

Sergentomyia Franca and Parrot 1920. The name was proposed to replace *Newsteadia* Franca 1919 (nec *Newsteadia* Green 1902), which was proposed to include six mediterranean species considered subgenerically distinct from *P. papatasi.* Later in 1920, Franca designated *P. minutus* Rond. as genotype of *Sergentomyia.* Rapp's designation of *P. papatasi* as genotype of *Newsteadia* is quite unwarranted. *Prophlebotomus* Franca and Parrot 1921, was split off from *Sergentomyia,* without type designation, but including *P. minutus,* the previously designated genotype of *Sergentomyia,* so that the name falls as a synonym of *Sergentomyia.* Rapp's action in selecting *P. perturbans* de Meijere 1909 seems unnecessary and would probably not alter the synonymy as Theodor (1948) lists *perturbans* as an unrecognizable species, probably belonging in *Sergentomyia.* According to Theodor (1948), *Neophlebotomus* Franca and Parrot 1920, (Type *P. malabaricus* Annand. 1910) cannot be separated from *Sergentomyia,* while *Brumptius* Nitzulescu 1931, is also a synonym, being isogenotypic.

The following names were proposed as subgenera with the types indicated by original designation.

Brumptomyia Franca and Parrot 1921. Type *P. brumpti* Larr. 1920.
Sintonius Nitzulescu 1931. Type *P. hospitii* Sinton 1924.
Larroussius Nitzulescu 1931. Type *P. major* Annand. 1910.
Adlerius Nitzulescu 1931. Type *P. chinensis* Newst. 1916.
Pintomyia Costa Lima 1932. Type *P. fischeri* Pinto 1926.
Evandromyia Mangabeira 1941. *P. infraspinosus* Mang. 1941.
Psychodopygus Mang. 1941. Type *P. unisetosus* Mang. 1941.
Viannamyia Mang. 1941. Type *P. tuberculatus* Mang. 1941.
Pressatia Mang. 1942. Type *P. triacanthus* Mang. 1942.
Castromyia Mang. 1942. Type *P. castroi* Barr. and Cout. 1941.
Dampfomyia Addis 1945. Type *P. anthophorus* Addis 1945.
Paraphlebotomus Theodor 1948. Type *P. sergenti* Parrot 1917.
Synphlebotomus Theodor 1948. Type *P. martini* Parrot 1936.
Euphlebotomus Theodor 1948. Type P. *argentipes* Ann. and Brun 1908.
Anaphlebotomus Theodor 1948. Type P. *stantoni* Newst. 1917.

Australophlebotomus Theodor 1948. Type *P. brevifilis* Tonn. 1935.

Spelaeophlebotomus Theo. 1948. Type *P. gigas* Parrot and Schwetz 1937.

Spelaeomyia Theo. 1948. Type *P. mirabilis* Parrot and Wanson 1939.

The paper by Theodor (1948) was, of course, not available to Rapp when he compiled his list, but Costa Lima's 1932 paper should have been consulted for the earlier names, while Mangabeira's publications all appeared several years before Rapp's list.

Tinearia Schellenberg 1803. This name is listed by both Enderlein and Rapp as valid with *Trichoptera fuliginosa* Meigen 1804 as genotype and *Ulomyia* Haliday in Walker 1856 as a synonym. Coquillet, however, (1910) designated *Psychoda alternata* Say 1824 as genotype, and placed *Tinearia* as a synonym of *Psychoda*. An examination of Schellenberg's original publication (Genres des Mouches Dipteres, representes en XLII Planches projettees et dessinees par Mr. J. R. Schellenberg et expliquees par deux amateurs de l'Entomologie. Zurich (1803) indicates quite clearly that Schellenberg is responsible only for the plates and the names appearing on them. Apparently the publishers felt some sort of text necessary for they appear to have secured the services of two anonymous "Amateurs" to supply this deficiency. There seems to have been no contact between Schellenberg and the authors of the text. The authors of the text state in their introduction that they intend to follow the classification of the "immortal Fabricius." They say also that the plates were already printed before they were asked to supply the text, and hence no changes could be made in the former. The result is that the plates often bear no names, generic names only, or names different from those given in the text. In the case of the *Psychodidae* the plate XL bears the supposed generic name *Tinearia,* but no specific name. The figures are numbered 1A, a, b, c, 2B and d. The explanation of the plate is on page 23 and gives the name as *Tipula Phalaenoides* Fabr. Ent. Syst. IV p. 251 No. 85. This covers figures 1A, a, b, and c of the plate. Figures 2B and d are named as *Tipula hirta* Fabr. Ent. Syst. IV p. 251 no. 84. The plates are very poor. No mention of the name *Tinearia* appears in the text.

Since the text of this work was not by Schellenberg and the name *Tinearia* is nowhere associated with a specific name either by Schellenberg or the anonymous authors of the text, it seems that the name must be considered a genus without species. Coquillet's

designation of *alternata* Say thus is valid, since the naming of the figures in the plate without using the generic name on the plate does not restrict *Tinearia* in any way. Enderlein seems to have been unaware of the dual authorship of this work, or of the previous designation of a genotype by Coquillet. Rapp, in following Enderlein, seems to have been unaware that *Ulomyia* Hal. (not Walker) 1856 was a substitute name for *Saccopteryx* Hal. 1839 preoccupied. Both names are listed separately as synonyms of *Tinearia* by Enderlein and Rapp on the basis of isogenotypy. *Ulomyia* is considered by recent workers (Coe 1945) as a subgenus of *Pericoma.*

Panimerus Eaton 1913 Trans. Linn. Soc. London (2) 15: 425–427. Type by original designation "*Panimerus hirtus* (Linn) (= notabilis Eaton)". Enderlein (1937) and Rapp give *P. scotti* Eaton 1913 as type, presumably because Enderlein (1935) designated *notabilis* Eaton as genotype of *Lepiseoda* End. 1935, a genus which he sank (1937) under *Panimerus* with the statement that Tonnoir considered *scotti* Eaton 1913 and *notabilis* Eaton 1893 synonymous.

Lepidopsychoda Edwards 1928, Insects Samoa, Pt. VI, fasc. 2, pp. 71–72, fig. 10, Type by original designation *L. tineiformis* Edwards 1928. Also includes *Brunettia trimicra* Edw. This genus is not mentioned by either Enderlein or Rapp.

Mesopsychoda Brauer, Redtenbacher and Ganglbauer 1889 (Akad nauk, SSSR Leningrad, Memoires, Ser. 7, Vol. 36, No. 15, pp. 1–22, 2 plates) with *dasyptera* sole species. Fossil. Jurassic. East Siberia. I have not seen the original description but Handlirsch (1908. Die fossilen Insekten, p. 629, pl. 51, fig. 4) has redescribed and figured the specimen. It is small, 3.6 mm. long, with the hairy wings folded tent-like over the abdomen. What can be made out of the venation is not very like modern Psychodids, but the material is probably not adequate for detailed comparisons. Handlirsch also creates the provisional genus *Psychodites* for two species, *kenngotti* Giebel and *egertoni* Brodie which he believes may be *Psychodids,* though from his figures there is little to support this view except that the wings are more or less hairy.

Parabrunettia Brunetti 1911. According to Tonnoir (1939) the history and synonymy of this name is as follows: *Parabrunettia* has as type *P. squamipennis* Brun., designated by Brunetti in 1912. But this species is a true *Brunettia,* hence *Parabrunettia* = *Brunettia. Parabrunettia* of Enderlein, with *B. indica* Eaton 1913 as type is subgenerically distinct, and Tonnoir proposes for it the name *Trichobrunettia.* He also points out that not only *B. indica* Eaton but also *Parabrunettia 9-notata* Brun. and *Psychoda duripuncta*

Curran are synonyms of *Brunettia albonotata* Brun. 1908, a more or less tropicopolitan species. Rapp apparently did not see this paper, as neither the generic nor specific synonymies nor the name *Trichobrunettia* appear in his lists.

Posthon Loew 1845 (Dipt. Beitr. 1: 9–10) Type *gracilis* Loew. 1850.

Phalaenomyia Loew 1845 (l.c.) no species named.

These two names, based on fossil material in amber, were placed respectively as synonyms of *Sycorax* and *Trichomyia* by Haliday, in Walker 1856, where they have remained. At least the first is nomenclatorially available, and should the type ever turn up, might well preoccupy later names. Their descriptions are meagre, consisting of brief comparisons with *Diplonema* Loew. Giebel (1856) has discussed all the fossil *Psychodidae* named at that time, while Meunier (1905) has described and figured a considerable number of amber forms and given keys to the known fossil genera and species.

Phalaenula Meigen 1800. Coquillet (1910) designated *Trichoptera ocellaris* Meigen 1804 as genotype. Eaton in 1904 had erected the genus *Clytocerus,* without type designation, but including by citation *Pericoma ocellaris* (Meigen) and *P. dalei* Eaton and a figure of the former. Enderlein in 1935 designated *P. dalei* Eaton as genotype of *Clytocerus,* but in 1937 he gives *ocellaris* Meigen as genotype, in which he is followed by Rapp. Stone (1941) considers *Clytocerus* to be a synonym of *Phalaenula,* apparently the only correct procedure under the rules if Meigen's 1800 names are accepted, while Coe 1945, recognized *Clytocerus* as valid with *ocellaris* and *dalei.*

Termitadelphos Holmgren 1905 Type *silvestrii* Holmg.

Termitodipteron Holmgren 1905 Type *Wasmanni* Holmg.

These two genera are not mentioned by Rapp or Enderlein, though Tonnoir (1929 p. 2 footnote) considers the first as a possible synonym of *Psychoda,* the second provisionally in the *Trichomyiinae.*

Eatonisca Meunier 1905. Type *E. tertiaria* Meun. 1905. Fossil in Baltic amber. This genus is placed next to *Horaiella* Tonn. by Enderlein, but omitted by Rapp, although he includes other fossil genera. I have seen the original description.

Eutonnoiria Alexander 1940 (Rev. Ent. 11: 794) Type *Bruchomyia edwardsi* Tonn. 1939. This name seems to have been overlooked by Rapp.

"Diplomia Annandale" Rapp and Cooper 1945 p. 211. This is a misspelling of *Diplonema* Annand. 1908, which name is preoc-

cupied by *Diplonema* Loew 1845, as discovered by Annandale two years later when he renamed the genus *Brunettia.* Rapp and Cooper list the single species *superstes* under *Diplomia* rather than under *Brunettia,* whose genotype it is. *Diplonema* Loew with type *buceras* is correctly listed by both Rapp and Enderlein.

There are a distressingly large number of minor errors and omissions in the series of papers by Rapp, but there seems no point in going into details. Dates are often omitted and references are in too many cases quite inaccurate. For example, in Rapp and Cooper 1945, pp. 214–215, *Nemopalpus australiensis* Alexander was described in Proc. Linn. Soc. N.S. Wales 53: 293–294, 1928, and *not* in the Federated Malay States Museum Journal 14: 65, as they have it. *N. orientalis* Edwards 1928, which *was* described in the Federated Malay States Museum Journal 14: 65, is not listed by Rapp. In the same genus *N. tertiariae* (Meunier 1905) and *N. molophilinus* (Edwards 1921), two fossil species, are nowhere mentioned by Rapp, while *N. zelandiae* Alex. 1921 is misspelled *zelandicus.*

In going over the faunal lists, no attempt was made at a complete check, but the following omissions should be noted. The genus *Maruina* is not listed as North American by Rapp, in spite of definite statements by Tonnoir (1929, 1934) and Edwards (1929) that *Pericoma californiensis* Kellogg represents the early stages of *Maruina lanceolata* Kinc. and that *Trichomyia unipunctata* Hasem. = *Maruina,* and by Johannsen (1938), who lists and gives a key to six species, three of them from the United States. Rapp places two of these latter in *Trichomyia* and omits the third entirely. True *Trichomyia* occurs in the United States also, as I have examined specimens of *T. urbica* Curtis in the U.S.N.M. from Virginia. I have also compared specimens of *Maruina lanceolata* Kinc. with the original descriptions of *Maruina* by F. Müller and consider them congeneric. It may be well to note here that the figure of the wing of *Maruina* in Curran's North American Diptera, 1934, p. 79 is a species of *Sycorax.*

The listings of the species of *Phlebotomus* are very far from complete. About a dozen species described previous to Rapp's paper on the African *Psychodidae* are missing, while *P. troglodytes* Lutz 1922, a Brazilian species, is listed as *P. troglodytes* Nitzulescu 1930 from Tunisia. The paper quoted is actually a discussion of differences between *troglodytes* Lutz and *brumpti* Larr. The Oriental lists are about equally incomplete and there are minor slips, such as the crediting of *P. barraudi* Sinton 1929, to Yao and Wu and *P. nicnic* Banks to Manalang. The recent paper of Theodor (1948)

adequately covers the Old World species. In the case of the Neotropical *Phlebotomus,* Rapp lists less than half of the species, 61 out of 124, described previous to December 1, 1943, the effective date of his list. There are a number of minor errors of spelling, and three species of *Phlebotomus, sordellii, squamiventris* and *tejerae* are listed under *Platyplastinx* End. The fine catalogue of Barretto (1947) may be consulted for a complete and accurate listing of the New World species.

Finally, Rapp has noted (1945 p. 262) that *Pericoma unicolor* Abreu 1930 is preoccupied by *Pericoma unicolor* Brun. 1911 and renamed the species *P. abreui.* Unfortunately Tonnoir (1934) made the same observation in addition to observing that the species was a *Telmatoscopus,* and renamed it *Telmatoscopus abreui.* On Rapp's paper on New Psychodidae from Barro Colorado Island (J. New York Ent. Soc. 53. 1945) I do not feel qualified to comment further than to state my opinion that if the drawings of wings accompanying this article are correct and not inadvertently inverted, it will be necessary to rather radically revise the current concept of the genus *Psychoda* to include them. I suspect that some or all of the drawings were made without denuding or mounting the wings.

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ON THE IDENTITY OF AGROTIS PYROPHILOIDES HARVEY (LEPIDOPTERA, AGROTINAE).

By James H. McDunnough, New York, N. Y.

In the course of a rearrangement of the Phalaenidae in the collection of the American Museum of Natural History, several points relating to the identity of *pyrophiloides* have been noted, and in connection with this the following notes are offered:

Pronoctua pyrophiloides Harvey.

Agrotis pyrophiloides Harvey, 1876, Can. Ent., vol. 8, p. 37; Smith, 1890, Bull. 38, U. S. Natl. Mus., p. 213.
Noctua pyrophiloides Smith, 1893, Bull. 44, U. S. Natl. Mus., p. 78.
Pronoctua pyrophiloides Hampson, Cat. Lep. Phal. Brit. Mus., vol. 4, p. 642, pl. 77, fig. 20 (as *Triphaena*); McDunnough, 1929, Bull. 55, Natl. Mus. of Canada, p. 72.

Smith, in his Catalogue of Noctuidae, records the type as being in the Henry Edwards' collection, mentioning that "a well-named specimen, not the type, is in the British Museum." Hampson merely lists two females from California in this latter collection, one being figured. A male specimen in the American Museum collection, *ex* Henry Edwards' collection, bears the number 5624, one of the numbers mentioned in Harvey's original description. To this specimen a red-bordered label is attached, bearing the name "Agr. pyrophiloides Harv." in Edwards' handwriting but no designation as type. The other number, 5662, listed by Harvey, is not to be found, and, lacking any information as to whether the specimen still exists, it seems best to follow Smith in considering the male, No. 5624, as the holotype. The locality label on the specimen is "Summit (in writing) Sier. Nev. Cal." and there is another pair before me from the same collection, similarly labeled. A pair, originally from the old Chatfield collection but unfortunately unlabeled, is also present; these two may quite possibly have been obtained originally from Edwards as they match the other specimens almost exactly. A slide of the genitalia of one of the males shows that I was incorrect in stating in my bulletin on Agrotid genera that this organ was similar to that of *typica* Smith; as a matter of fact, the structure is much closer to that found in members of the genus *Abagrotis,* the clasper terminating in a single blunt point without corona and the sacculus projecting roundedly over the basal portion of the costa. As to the status of *peabodyae* Dyar, described from a male from Bluff, Utah, and stated to be a pink-shaded form of *pyrophiloides,*

nothing can be said, as material for examination is lacking; it might be better referred to *typica,* a Rocky Mountain species of very similar appearance but larger and lacking the distinct smoky terminal area of primaries found in *pyrophiloides.*

FORMATION OF THE ENTOMOLOGICAL SOCIETY OF CANADA.

At the eighty-seventh annual meeting of the Entomological Society of Ontario, held at Guelph on November 1–3, 1950, it was decided to form a national society, to be called the Entomological Society of Canada. The new society will serve as a link between the various regional societies, namely, the Acadian Entomological Society, the Entomological Society of Ontario, the Entomological Society of Manitoba, the Entomological Society of British Columbia, the proposed entomological society of Quebec, and others that may be established. The **Canadian Entomologist** will be published jointly by the Ontario and the national societies, Dr. W. R. Thompson continuing as Editor, with Dr. G. C. Ullyett as Associate Editor.

W. A. Ross, Division of Entomology, Ottawa, was elected President and Professor A. W. Baker, Ontario Agricultural College, Guelph, Vice-President. R. H. Wigmore and A. B. Baird, Division of Entomology, Ottawa, have been named Secretary and Treasurer respectively. The Directors comprise the presidents of the regional societies, namely, D. D. Pond, Fredericton, N. B.; W. N. Keenan, Ottawa, Ont.; C. A. Smith, Winnipeg, Man.; and Prof. G. J. Spencer, Vancouver, B. C.; as well as Father O. Fournier, President, Montreal Branch of the Entomological Society of Ontario; Dr. C. W. Farstad, Dominion Entomological Laboratory, Lethbridge, Alta.; and Dr. A. S. West, Queen's University, Kingston, Ont.

The annual meeting of the national society will always be held jointly with the annual meeting of one of the regional societies. In 1951, the combined meetings will be held at Ottawa.

GRACE HERRESHOFF SPERRY

Mrs. Grace H. Sperry, a widely experienced field lepidopterist, died at Walla Walla, Washington on August 29, 1950 after a brief illness resulting from a coronary occlusion. Mrs. Sperry specialized on the Notodontidae of America, north of Mexico, and was also greatly interested in the Phalaenidae. She described *Chlorocleptria jaegeri,* a new heliothid moth (Canadian Entomologist, July, 1940, p. 147) and in collaboration with Dr. J. A. Comstock and John L. Sperry, published notes on the life histories of two new Arizona butterflies (So. Calif. Acad. Sci., Vol. 32, P. 99, 1933). During the past summer, in her Oregon cabin, she worked with her husband on the Geometridae and Notodontidae of South America. Over the years she has been honored by a number of entomological associates who named after her more than a dozen insects which will constitute a permanent memorial to her in the literature of entomology.

Born in Bristol, R. I., in 1881, Mrs. Sperry was the daughter of the late Julian L. and Ellen F. (Taft) Herreshoff. Her father, though blind, was a talented pianist and linguist and his daughter inherited these talents to a high degree. As a girl, she also developed an interest in the natural sciences and carried this interest into adult life in botany, ornithology, geology and notably in entomology.

In 1919, she married John L. Sperry, a distinguished lepidopterist, and after the death of her parents, they settled in the west. At the time of her death she was a resident of Las Vegas, Nevada, with a winter home in Riverside, California and a summer home in the Wallowa Mountains of northeastern Oregon. Much of her time, however, was spent in the field with her husband, frequently under canvas, in some remote wilderness where she was equally at home.—R. R. McElvare.

A Flight of Water Boatmen: At Utah Hot Springs, on the night of July 19, 1950, I encountered such a vast flight of water boatmen as I had never seen before. This was observed from 9 to 9:45. However, the folks at both the service station and the restaurant where this flight occurred, reported that the bugs had arrived in a great swarm about 20 minutes before I stopped by (which would be approximately 8:40 p.m.).

Dr. H. B. Hungerford reported that the specimens I sent him from this flight were, in the order of their abundance, *Corisella decolor* (Uhler), *Sigara* (*V.*) *nevadensis* (Walley), *Trichocorixa verticolis interiores* Sailer and *Hesperocorixa laevigata* (Uhler). The principal flight was swirling beneath a very bright service station light which had a large reflector. This light was mounted on the south gable of the restaurant, and this building broke the strong northwest breeze. The first 12 sweeps which I made with my insect net, through the teeming thousands of water bugs in front of the restaurant door, gathered in specimens which completely filled a 1 × 6 inch pocket cyanide bottle, and filled more than one-third of another. I collected well over a pint of the bugs before leaving and I could have taken a great many more.

When I first observed the great flight, a large "wing" of the insect population was flying actively in front of the restaurant door. Within five minutes of my arrival, 99 percent of these bugs had moved on, to join the "teeming horde" beneath the large light, a rod or so to the south west. An area of ground, approximately 18 × 24 feet in size, which was flooded by the light, was literally "blackened" with living bodies of countless water boatmen. In two smaller spots in this area, the bugs "poured down" in especially large numbers. It appeared that in these places the bugs piled up to a height of nearly one inch in thickness at the peaks of the mounds, which gradually sloped to the level of one or two bugs in thickness. The ground was entirely obscured by the bugs which covered it in the best lighted area.

Only a small flight of bugs was present at the bright light located to the south of the service station, at the top of a steel pole. Being fully exposed to the strong breeze, except for the area of the reflector, may have made this light unattractive. A few thousand bugs were flying about smaller service station lights, which were located beneath the roof. Also, many bugs had alighted on some water which the attendant had sprayed on the cement floor, in front of the service station.

By the time that I left, the population and activity were decreas-

ing. I drove on north to a service station at Perry (south of Brigham City) arriving at 10 p.m. Here the service station attendant reported that a very large flight of insects had suddenly appeared during the evening, but had left more than an hour ago. I picked up quite a lot of water boatmen here, also. Maybe the flight that had enveloped this service station, earlier in the evening, had later become a part of the vast flight which I had encountered at Utah Hot Springs.—George F. Knowlton, Logan, Utah.

Nabis "Bites" Man: On a number of occasions, adult and nymphal damsel bugs have been found to "bite" us as we have worked with them over the past several years. On July 18, 1942, at Logan, Utah, an adult *Nabis alternatus* (Parshley) was placed on the arm of the senior writer, near the biceps, and held in place by bending the arm. The head of the damsel bug faced upward and was free to move. The tip of the proboscis was promptly moved from its normal position, to a point resting against the skin of the arm, where its contained stylets pierced the skin. Immediately there was a sharp pain, although it was not great. Pressure on the *Nabis* was eased and the pain subsided, but when the pressure again was increased, a second puncture was made and this time the pain was greater than before. The two skin punctures were made near each other. After 15 seconds the area became very painful and there was an intense desire to scratch the place where the puncture occurred. The *Nabis* was then released and the punctures examined. The area pierced was distinctly inflamed and the itching sensation persisted for some time.

Within two minutes, swelling began in the area of the punctures. After the lapse of an hour, two separate swellings were visible, each about one-sixth of an inch in diameter and about one-tenth of an inch high. At the center of each welt was a small spot of blood. At the end of twenty-four hours effects of the punctures had completely disappeared.

Numerous bites by *Nabis* bugs have been experienced by workers conducting alfalfa and pea insect investigations in Utah. Most of these have occurred on the arms when they were wet with perspiration. However, other such bites have occurred on hands, neck and face. Such bites were definitely painful; therefore, feeding seldom was permitted to continue for more than one to three seconds. As a result, effects of other bites were less severe than those described above.—Reed S. Roberts and G. F. Knowlton, Logan, Utah.

REVISION OF THE SPECIES OF THE SUBGENUS TRICHOCLADIUS FROM THE NORTHEASTERN STATES (CHIRONOMIDAE, DIPTERA).

By O. A. Johannsen, Ithaca, New York

Trichocladius was established by the Abbé J. J. Kieffer in 1906 for a small group of Chironomids that have pubescent eyes and that were previously included in the genus *Orthocladius* of Van der Wulp (1874). About 20 years ago a further reduction was made by Dr. F. W. Edwards when he transferred from *Trichocladius* to *Cricotopus* those species that have only vestigial dorso-central hairs. By this change the two North American species *politus* Coq. and *infuscatus* Malloch will find a place in the genus *Cricotopus.*

The subgenus *Trichocladius* thus restricted may then be defined as follows:

Eyes pubescent but usually less densely so than in *Cricotopus,* pile shorter than the diameter of the facets; dorso-central hairs of the mesothorax distinct, and suberect; humeral pits in some species may be unusually large; scutellum in most cases brightly shining. Wings more or less whitish, without distinct microtrichia; second branch of the radius ends near the middle of the distance between tips of first and third branches; posterior cubital branch not bent or but slightly so; fork of the cubitus not much beyond level of crossvein; anal vein ends distinctly beyond cubital fork; squamae with complete fringe. Fore tibiae each with a spur, middle and hind tibiae each with two, the outer one of hind tibiae may be vestigial; hind tibiae each also with a transverse, apical comb on the inner side; fore tibia longer than the basitarsus. Pulvilli in most cases small or absent. In one group (*Acricotopus*) of the members of this subgenus the antennae of the female are seven-segmented, the last segment nearly or quite as long as the three preceding; humeral pits of moderate size or small; hypopygium of the male without anal point; pulvilli small or absent. In the other group (*Trichocladius* str. sens.) antennae of the female are six-segmented, the sixth usually rather short; humeral pit in most cases rather large, hpyopygium of the male with a distinct hairy anal point; pulvilli distinct, in few cases rather large.

Key to Northeastern Species

1. Males 2
   Females 6

2. Ground color of thorax and bases of femora yellow, the vittae on mesonotum black. Costa of wing produced beyond tip of posterior branch of radius, the latter ending a less distance in front of wing tip than the anterior branch of the cubitus does behind it; inner lobe of the basistyle triangular, acute, the base wider than the height. Length 3 mm. *striatus* Mall.

   With another combination of characters 3
3. Anal point of hypopygium absent; body shining black; antennal ratio 1.8; humeral pits moderate; leg ratio 0.65; wing length 2.2 mm. .... *senex* Joh.

   Anal point present 4
4. Thorax glossy black, without pale markings; halteres black ... 5

   Thorax either yellow with dark vittae, or opaque black; halteres pale. Small species 1.75 to 2 mm. in length. *distinctus* Mall.
5. Scutellum and abdomen opaque, velvet black, the last 3 segments with faint pale margins; anal point hairy. Length 2 mm. .... *nitidus* Mall.

   Mesonotum, scutellum and abdomen shining black. Length 3.5 mm. .... *nitidellus* Mall.
6. Small species 1.75 to 2 mm. in length. Thorax yellow with opaque black vittae; abdominal tergites largely dull black. *distinctus* Mall.

   Larger species 2.5 mm. or more in length 7
7. Antennae seven-segmented; body shining black, humeri indistinctly yellowish. Length 2.7 mm. Wing length 2.2 mm. *senex* Joh.

   Antennae six-segmented; body yellowish, thoracic vittae brown; abdominal tergites brown; costa of wing produced; pulvilli large, nearly as long as the claws. Wing length 3.5 mm. *lacteipennis* Joh.

Notes on the Species.

T. senex Joh. (1937). This species belongs to Edwards' group A which corresponds to Kieffer's *Acricotopus*. The members of this group have in common, humeral pits that are small or of moderate size; pulvilli vestigial or minute; hypopygium of male without anal point; and in the female a seven-segmented antenna. This species resembles the European *T. lucidus* (Staeger) as described by Edwards (1929) and by Goetghebuer (1932) except for the antennal ratio and for the form of the inner lobe of the basistyle.

The first few abdominal tergites have flat lateral expansions. The species was reared from larvae collected in a small alga-covered pond near Ithaca, N. Y.

T striatus Mall. (1915). To Malloch's description of this species may be added that the humeral pits are large and distinct and that the pulvilli are broad and nearly as long as the claws, resembling those of the members of the genus *Psectrocladius.* The last mentioned character, shared by the next species, suggests the possibility that they may be the two sexes of the same species. In both of them the costa of the wing is produced beyond the tip of the posterior branch of the radius, the latter ending nearer the tip of the wing than the anterior branch of the cubitus. It resembles the following also in coloring. Dubois, Ill.

T. lacteipennis Joh. (1908). Eyes densely pubescent, the pile shorter than the diameter of one facet. Palpi rather short, the terminal segment as long as the three preceding segments taken together. Antennae six-segmented, the second segment slightly constricted before the middle, third to fifth short, fusiform, the sixth nearly as long as segments three to five combined. Ground color of thorax yellow, with three brown dorsal vittae, metanotum blackish. Humeral pits large and distinct; dorso-central hairs, though fine, are sub-erect and arise from distinct punctures easily visible under a magnification of 40 diameters. The legs are yellow, tips of tibiae and tarsi somewhat darkened. On underside close to tip of middle femur there is a stout, tapering, obliquely truncated tubercle about half as long as the diameter of femur at this point and but little longer than wide. As usual in members of this group, the fore tibia has one, middle and hind tibiae each two spurs, hind tibiae in addition have a transverse row of bristles forming a comb, at apex on inner side. The pulvilli are unusually large for members of this subgenus, resembling those of the subgenus *Psectrocladius.* The wings have no microtrichiae; the costa is well produced beyond tip of posterior branch of radius; second branch ends a little before mid point between tips of anterior and posterior branches; cubitus forks a trifle beyond the level of cross-vein; anal vein ends well beyond this fork. Wing length 3.5 mm. Squamal fringe complete. Harrisburg, Pa.

T. distinctus Mall. (1915). Male. An opaque black species with head, space between thoracic vittae, upper margin of pleura, hypopygium, posterior half of abdominal tergites 5 and 6, venter largely, legs (except coxae, tips of tibiae and fifth tarsal segments) and halteres, yellow. Hypopygium with hairy anal point and large

triangular inner lobe of basistyle. Tips of posterior branch of radius and of anterior branch of cubitus about equidistant from wing tip. Length 1.75 to 2 mm.

Female. Yellow markings on thorax and abdomen more extended than in the male. Havana, Ill.

Two varieties of this species, var. *basalis* and var. *bicolor* differ slightly in the extent of the yellow coloring.

T. nitidus Mall. (1915). Male. Head and thorax glossy black, scutellum and abdomen velvet black. Legs and halteres dark. Hypopygium with hairy anal point, large triangular inner lobe of the basistyle; wings with cubital fork almost directly below the crossvein. Length 2 mm. Monticello, Ill.

T. nitidellus Mall. (1915). Male. Head, including antennae, black; clypeus yellowish. Thorax and abdomen glossy black. Legs yellow, femora, tips of tarsi and halteres brown. Apical segment of antenna about twice as long as the other flagellar segment combined. Basistyle of hypopygium with large triangular inner lobe of which the posterior margin has a small notch. Cubital fork distinctly distad of crossvein. Length 3.5 mm. Ill., N. Y.

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I am indebted to Dr. H. H. Ross for some notes on two of Malloch's species.

Note on Chlorocleptria jaegeri: The passing of Grace H. Sperry, recorded elsewhere in the Bulletin, recalls the interesting circumstances which led to her describing *jaegeri*. In conversation of the Sperrys with Edmund C. Jaeger of Riverside, California, an authority on the deserts of that state, discussion turned on the affinity of heliothid moths for particular flowers, such as *Thyreion ligeae* Sm. for the Mohave aster (*A. tortifolius*). Prof. Jaeger mentioned a rare aster, *A. orcuttii,* growing in remote canyons on the southwest side of the Salton Sink, and the question arose whether this aster might not be host to some unknown heliothid. An expedition was planned to Split Mountain Canyon after the winter rains and there, on April 12, 1939, the Orcutt aster was found in bloom on the floor and sides of the canyon. On the flowers, the Sperrys took specimens of a new heliothid moth, later described by Mrs. Sperry as *C. jaegeri.* (Canadian Entomologist, July 1940, p. 147.) Years ago many collectors would have considered such a locality an entomological secret to be jealously guarded, but in April 1941, when I was in the southern California deserts, the Sperrys took me to the type locality where again the flowers were in bloom and we took an additional representation of *jaegeri* Grace H. Sperry.—Rowland R. McElvare, Port Washington, L. I., N. Y.

A European Neidid in Massachusetts: *Berytinus minor* H.-S., a European species of Neididae (Hemiptera) reported by Torre-Bueno in *Entomologica Americana* XXI, p. 103, 1941, as occurring in Michigan, has been found in considerable numbers in Amherst, Massachusetts. The species was first noticed in student collections in 1947, and has since been collected each spring during late April and May. It occurs in greater numbers than its nearest ally, *Neides muticus* Say, from which it may easily be distinguished by its smaller size, and its very much shorter and less threadlike legs and antennae.

The species is recorded as being distributed throughout Europe, into Siberia and Algeria, and in Britain, where it is a ground insect of sluggish movements, usually found in dry places and hibernating as an adult. Although local specimens all show fully developed wings, in Europe it occurs in both brachypterous and macropterous forms, the former being much the commoner.—Marion E. Smith, Amherst, Mass.

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CONTENTS

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ODONATE BIONOMICS: I—NOTES ON THE FOOD OF DRAGONFLIES. 1. ODONATA VS. ANTS AND BEES.

By George H. Beatty, III, Plumsteadville, Pennsylvania.

Various species of dragonflies have been collected which were found to have the mouthparts of ants or bees attached to their legs. How these insects became so attached has remained largely a matter of conjecture, however, since apparently no one has observed an engagement which resulted in this state of affairs. A few authors have reported cases of dragonflies feeding on ants. Butler (1915) described the decimation of a flight of ants by several species of dragonflies, but collected no specimens, leaving unknown the identity of the insects involved. Lamborn (1922) refers to an unnamed species of Odonata catching worker ants in Nyassaland, and Hobby (1936) cites both sexes of the cosmopolitan *Pantala flavescens* as "eating bodies only of winged Formicidae" in Coimbatore, India. In none of these cases were specimens of the dragonflies with their prey obtained, and only in the last-named instance is specific identification of the dragonflies made. Although a number of accounts have been published which enumerate the food of various species of dragonflies, so little accurate observation has been made of the actual feeding habits of adult dragonflies that discussion of the subject necessarily involves a certain amount of speculation. One of the purposes of this paper is to stimulate interest in the feeding habits of dragonflies, and all observations will be gratefully received by the author.

There are two questions which should be dealt with before attempting to explain the occurrence of dragonflies with the mouthparts of other insects attached to their legs. What role do the legs of an adult dragonfly play in the capture of its food? How much discrimination do these insects exercise in the selection of their diet?

It has been generally supposed that dragonflies scoop their flying prey out of the air by forming a "basket" of the legs, drawing them up under the head. Hobby (1933) gives a comprehensive account of dragonfly feeding and states "Smaller insects are probably taken directly in the mouth . . . larger ones are secured by the long legs which hang below to form a 'capture-net.'" Sharp (1895) says "We believe that the legs are of great importance in capturing the prey, they being held somewhat in the position shown. . . ." and gives an adequate figure. Sharp also goes on to give a detailed and illuminating account of the feeding of Odonata in which he again states that the legs, rather than the mouth, are probably the primary instrument of capture, but that the transfer of prey to the mouth occurs so rapidly as to be virtually unobservable. But quite contrariwise, Montgomery (1925) reports the following personal observation. "A number of dragonflies were hawking in an open space in the woods. Three taken were all different species, *Aeschna constricta, A. umbrosa,* and *Anax junius.* I spent about two hours watching them catch Diptera. As a dragonfly approached a small insect it checked its speed slightly and drew its head upward and backward until the mouth was in an anterior position. The prey was caught in the mouth and the mouthparts were seen to move rapidly as the dragonfly flew on leaving a vacant space where a small insect had been seen a moment before." If this observation is accurate, it bears out a remark made by Sharp (1895) in a passage preceding the one quoted above, where he states "it is believed that the mouth is largely instrumental in the capture, though the flight of these insects is so excessively rapid that it is difficult, if not impossible, to verify the action of the mouthpieces by actual observation." This statement is rather inconsistent with Sharp's more detailed account of the feeding of Odonata which stresses the importance of the legs, but, withal, his account is one of the most thorough in the literature. It is the experience of the present author that valid observations on the feeding habits of dragonflies are so difficult to make that only a stroboscopic camera could yield completely reliable results.

From the foregoing it is apparent that some dragonflies may capture their prey by means of the legs alone while others employ only the mouthparts, and that the use of both legs and mouthparts is the most likely procedure. However, it has not yet been shown that any species confines itself entirely to any of these habits. The large, rapacious species like *Tachopteryx thoreyi* and *Hagenius brevistylus* often capture and subdue insects almost as large as themselves, a feat which they could hardly accomplish without the

use of the legs. Calvert (1893), without stating how the food is captured, writes "The first pair of legs are usually employed to hold the food as it is devoured." This is particularly true of these savage species which must devour their prey piecemeal. It certainly agrees with the present author's observation of *Hagenius brevistylus* in New Jersey, where one was seen to capture and devour a mature *Libellula incesta,* perching on a dead branch with the two posterior pairs of legs and using the first pair to hold and manipulate the prey while it was being eaten. Another large gomphine, a new species from Florida not yet described, was also seen to overpower and eat a female *Libellula incesta* in identical fashion, and in this case there was very little difference between the size of the hunter and that of the victim. It is obvious that such captures could not have been made with the mouthparts alone.

It is probably only when the prey is small and weak in proportion to its captor that the legs are not used. The writer has seen *Enallagma aspersum* in New Jersey, catching tiny white flies, apparently without using its legs; and he has also seen fairly large crane-flies captured by *Didymops transversa,* which flew with its remarkably long legs plainly extended downward and not drawn up under the mouth. Brues (1946) cites a New Zealand species, *Somatochlora smithii,* which has been seen to dive into the water, immersing its head, to capture midge larvae or pupae. Various North American dragonflies, especially those of the genus *Stylurus,* are often seen to plunge into the water. Williamson (1934) gives a typical account, but neither he nor any other author has discovered why these insects do so; it remains unknown whether they dive for food, drink, or pleasure. The present writer seriously questions the accuracy of Wilson's account and interpretation quoted by Needham and Heywood (1929, p. 101).

It is the conclusion of the author that in most cases dragonflies capture their prey by using legs and mouthparts together, the legs being used at least to guide and stuff the prey into the open mouth which also assisted in the capture. Occasionally a dragonfly may use legs or mouth alone, but this does not seem to be the normal procedure. It is quite obvious, then, that an ant or bee, if captured by a dragonfly, would sometimes have an opportunity to seize its captor by the legs, something it could not do if mouth alone were used, especially in the case of a wingless ant which must be picked up from the ground or from vegetation.

The diet of Odonata is notoriously diverse, many species devouring almost any insect which they are able to subdue and which is soft enough for them to chew up. Williamson (1900) remarks

"Of the insects eaten diptera are more preferred than any other order, though all soft bodied insects seem to fall prey to their ravenous appetites." This is borne out by Campion (1914, 1921), Hobby (1933, 1936), and Poulton (1906), whose reviews of dragonfly food show that Diptera are more favored than all other orders combined. Ants are rather hard-bodied, however, and it seems that they do not form an important part of any dragonfly's fare. Indeed, the only definite case of ants being eaten which is cited in any of the five papers just referred to is the one mentioned by Hobby (1936) who quotes a correspondent regarding *Pantala flavescens* eating winged ants in India. Though the reviews of Campion and Poulton cite insects of many orders as food of Odonata, they include no Formicidae. The latter author states, "Short as it is, the list is extremely interesting, and raises the expectation that Dragonflies will be found to prey rather largely upon specially defended groups of insects. Bequaert (1930), in a study of the enemies of ants, cites only two cases of ants being eaten by dragonflies. They are those reported by Butler (1915) and Lamborn (1922). If dragonflies prey only incidentally on specially protected insects, it is significant that Bequaert (loc. cit.) reaches the conclusion that ants are not specially protected to any great extent.

Assuming that there is an actual preference for soft bodied insects (Hobby, 1933), it is possible that a dragonfly, despite its reputedly superior vision, would fail to recognize an ant or beetle as unsuitable for food until it was in its grasp. In such a case it would probably drop the undesirable victim unless, as in the case of an ant, it were first seized by it. Instances of such rejections have not been reported, though Williamson (1932) makes the following remarks about *Boyeria vinosa* in Missouri. "Its food so far as observed consists of minute and usually aquatic insects which it captures with a bobbing-in-and-out flight about logs, trash, and overhanging nooks, usually along the course of a stream. It discriminates in its food, rejecting some insects after approaching very near to or seizing them. Instances of this were not infrequent but the distance always prevented determining certainly whether the rejected insect was seized or not." Here the question arises of a dragonfly learning what food is suitable and remembering in some way to reject unsatisfactory insects, though Hobby (1933) points out that some prey may escape for reasons of size, rather than being deliberately rejected. In spite of Williamson's observation, just quoted, most of the evidence points to the truth of the statement made by Brues (1946) that "dragonflies have not developed specialized dietaries" and will try to eat anything of suitable size and abundance. That

no large group of dragonflies discriminates against ants or other unsuitable food is suggested by the following specific cases which fall into six different families of Odonata.

Williamson (1918) made the following remarks about a very small gomphine, *Archaeogomphus hamatus,* from Colombia. "One female specimen has the head of a bee attached to the left hind tibia. The apex of the tibia is broken off, the mandibles of the bee gripping the tibia firmly near its base. Through the kindness of Mr. Currie this specimen was submitted to Mr. J. C. Crawford of the United States National Museum who reports that 'the head is that of one of the stingless honeybees, *Trigona* sp. These bees, of which there are many species in the tropics, are social in their habits, and build nests, combs, etc., and store honey. It is possible that the dragonfly was attacked by the bee when in the vicinity of its nest, but more probably the dragonfly captured the bee which seized its captor by the leg before being dispatched.' " Dragonflies have been frequently cited by apiarists as predators upon their domestic honeybees. Bromley (1948), Clausen (1940), Goodacre (1923), Hobby (1933, 1936), Johnson (1899), Needham and Heywood (1929), and Wright (1944) are among the writers who have discussed bee-eating Odonata. In the New World, the most destructive dragonfly to bees is *Coryphaeschna ingens,* often called the "bee butcher," while in Europe *Aeshna cyanea* and *Brachytron pratense* cause serious losses to beekeepers. These are all large, powerful insects, so it is interesting that bees are also attacked by the tiny *Archaeogomphus.* This case is also of interest because it may be the only recorded instance of a bee's mouthparts being found attached to any species of Odonata. The suggestion that the dragonfly might have been attacked by the bee is plausible in view of the former's relatively small size and this opens a new line of inquiry. There are no records of bees' mouthparts being found attached to any of the large species noted for their depredations on honeybees, and this suggests that the bees may be caught and devoured by the dragonfly without the use of its legs, giving the bee no opportunity to seize them.

Another interesting case was recorded by Montgomery (1932) who captured in Indiana a male of *Tachopteryx thoreyi* which had the head of an ant attached to the tarsus of the second left leg. This ant was identified as *Camponotus herculeanus pennsylvanicus* De Geer by F. M. Gaige. It seems likely that the head is that of a wingless worker since such forms greatly outnumber the winged sexual forms which occur only occasionally. Of course, it is difficult to determine the sex of an ant from the mandibles alone, so no

definite statement can be made whether the ant was a winged form or a worker. While Lamborn (1922) did cite workers as food of dragonflies, the few other authors who had anything to say referred only to winged ants. Perhaps this is because the mass mating flights of ants are conspicuous and their invasion and decimation by dragonflies would be more often noted than the capture of a solitary wingless individual.

Byers (1927) mentions a female of *Enallagma laurenti* to which an ant, *Darymyrmex pyramicus,* was attached. Williamson (1922) cites a male of *Enallagma cardenium* from Florida which has the head of a male *Pseudomyrma* sp. attached by the mandibles to the left middle tarsus. Male ants of this genus are all winged and most of the species are arboreal, according to F. M. Gaige, so it may have been seized while in the air or while running over vegetation. Williamson (1922) also mentions another ant of which head and thorax were attached to one of the legs of a *Hetaerina laesa* from British Guiana. Dr. Gaige identified this ant as a minor worker of *Pheidole* sp. and stated that many species of *Pheidole* forage on vegetation to the height of several feet and that they are "pugnacious little devils." Williamson goes on to say "Such an ant might conceivably seize a resting dragonfly by its legs, but I have little doubt that the dragonfly was the aggressor and that it plucked the ant from its perch, and the ant retaliated by seizing a leg in a death grip."

In the experience of the present writer, two species of Odonata have been collected in Pennsylvania with the mandibles of ants attached. One of these, a female of *Aeshna tuberculifera,* has the entire head of a *Camponotus* affixed to the right front tarsus at its base. The other, a female of *Libellula semifasciata,* has the mandibles of a large ant, probably *Camponotus,* attached to the extreme distal end of the left middle tibia. The chewed condition of this latter ant's head indicates that the dragonfly made more than a little effort to disengage it.

In the case of *Archaeogomphus,* it is quite reasonable to suppose that the bee was caught by the dragonfly while the former was in flight, but in the instances of *Tachopteryx Aeshna,* and *Libellula* it seems unlikely that the ant was a winged form in every case. How, then did the wingless ants manage to attach themselves to the dragonflies? Did they attack the dragonflies while they rested or did the dragonflies capture the ants while they ran along the ground or over the vegetation?

The habits of *Tachopteryx thoreyi* are well known and it has often been reported that its normal food includes moths, butterflies,

and other dragonflies, taken on the wing. The prowess of *Tachopteryx* at capturing such large prey has been frequently acclaimed, but it is unlikely that this insect would often seek out so small and elusive a quarry as an ant, unless hard pressed by shortage of its usual food. Nevertheless, it is even more unlikely that even the most ferocious ant would seize the leg of a *Tachopteryx* while it rested on a tree trunk unless the dragonfly attempted to catch a passing ant. This latter possibility is so remote that it is reasonable to conclude, assuming the ant wingless, that the flying *Tachopteryx* caught the ant as the latter ran across a leaf or some similar exposed situation. Swynnerton (1936) cites a dragonfly, *Cacergates leucostictus,* as searching the backs of animals and men in Africa for tsetse flies. This shows how it is quite possible for dragonflies to pick up their victims from the ground or from the vegetation, though such a performance has been noted but rarely.

In the case of *Aeshna tuberculifera,* the normal food of this species corresponds to ants in size, if not in other characteristics. It has been generally concluded that the food of most species of *Aeshna* consists largely of small, soft-bodied Diptera and Hemiptera. They undoubtedly vary this diet considerably but few instances of the exceptional voracity displayed by *Tachopteryx, Hagenius, Anax,* and similar species have been pointed out. The writer has often seen individuals of *Aeshna umbrosa* flying about close to the foliage of trees and bushes, hesitating here and there as if about to alight but never alighting. It was impossible to determine whether or not *umbrosa* was intent upon catching insects on the leaves, but, if such were the case, it is altogether likely that some ants were being caught and that these would occasionally include species large enough to seize the dragonfly's leg and maintain their hold. Certainly, if the dragonfly were pursuing its supposedly normal diet of Diptera, it would confine its attention to the open spaces where mosquitoes, gnats, and midges dance about in throngs. Walker (1912) has mentioned this tree-searching habit of a species of *Aeshna,* but does not consider the possibility that ants were being caught.

Libellula semifasciata, often a woodland dweller, has food habits which make the presence of the ant's mandibles more easily explainable. In woodland clearings, in the early springtime, *semifasciata* is often seen flying about close to the vegetation, dipping down to a leaf from time to time, catching small insects; so it is to be expected that a few ants would be caught.

In the case of the small Zygoptera such as *Enallagma,* most species of which pursue their prey over the water, the best explanation

is that an aggressive ant affixed itself to the damselfly's leg while the latter insect was at rest. Even though this is in disagreement with Williamson's views quoted previously, the present author's observations are that the food of the smaller Zygoptera consists largely of minute Diptera which are usually so abundant about aquatic habitats that the capture of a suitable small winged ant would be a rare occurrence.

It has been suggested that ants attack teneral dragonflies soon after emergence. Indeed, Calvert (1913) mentions a specimen of *Tetragoneuria,* arrested in transformation, which was collected while still alive, but which had the last five segments of the abdomen more or less destroyed by ants. In such cases, however, the legs of the dragonfly are so poorly chitinized that they would be completely severed by a strong-jawed ant, and the dragonfly's mouthparts would be far too soft to make any impression on the ant's hard integument. This fate cannot befall a very great percentage of emerging Odonata since the majority of transformations takes place on emergent vegetation or in other situations often inaccessible to ants. In all probability, most of the dragonflies which are attacked by ants while teneral perish without offering much resistance.

Conclusions.

Because of conflicting statements of various authors cited, and the lack of reliable information on important points, few positive conclusions can be reached. However, the evidence points to the following generalities:

1. Dragonflies generally employ the legs to some extent in capturing their prey, though mouth alone is sometimes used to secure insects too small to be caught by the legs.

2. That dragonflies favor no particular pair or pairs of legs in capturing their prey is shown by specific cases of mouthparts attached to legs of all three pairs.

3. They have not been shown to avoid any group of insects in their dietary, and may be expected to prey upon ants and bees in proportion to their abundance.

4. Therefore the occurrence of dragonflies with the mouthparts of ants and bees attached to their legs can best be attributed to defensive seizure by these insects of the legs of their captors.

5. There is some evidence of an occasional offensive seizure of a dragonfly's leg by an ant or bee, especially in the case of small, delicate species such as *Enallagma.*

6. The inadequacy of information on this subject indicates the

need for much careful observation of the feeding of Odonata, and accurate reporting of factual data pertaining thereto.

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The Lepidopterist's Society: The first annual meeting of the Lepidopterist's Society was held December 29–30, 1950 at the American Museum of Natural History. At that time the Society was formally organized, with the adoption of a Constitution and By-Laws. The following officers were elected: J. H. McDunnough, President; A. H. Clark, Senior Vice President; W. Forster, K. J. Hayward, Vice Presidents; F. H. Rindge, Secretary; J. B. Ziegler, Treasurer. Members of the Executive Committee: H. Stempffer, T. N. Freeman, L. M. Martin, N. D. Riley, T. Shirozu, and J. G. Franclemont.

A number of papers were presented by members, including a symposium on "Geographic Subspeciation in Lepidoptera." Some painting, photographs, and exhibits, submitted by members in this country and abroad, were on display during the meetings.

ON THE GENUS THAUMAPHRASTUS BLAISDELL (COLEOPTERA: THORICTIDAE).

By F. I. VAN EMDEN, London, England

In describing the larva of *Thaumaphrastus* in the October 1949 number of this Bulletin, Wm. H. Anderson came to the conclusion that the genus belongs to the family Dermestidae, in which it forms a new subfamily. Anderson considered as quite possible that the genus was described in some other family under an older name.

The type of *Thaumaphrastus karanisensis* Blaisdell 1927 was found in a plant gall buried for the best part of 2000 years in the Egyptian town Karensis, whilst Anderson's additional material was bred from specimens found in a rice mill. It is interesting to note that *Thorictodes heydeni* Reitter was also first found in Egypt and was later rediscovered in rice in France; it has also been recorded from Algeria, Syria, Sudan, and Java and as introduced into Spain, Sweden (Jansson 1915, Ent. Tidskr. 36: 39) and Great Britain (Walker 1925, Ent. month. Mag. 61: 92). The species is carried by commerce (rice, ground-nuts, wheat, kapok seed, and grains of probably *Eleusine coracana* used for feeding fowls).

Anderson's excellent descriptions and figures of adult and larva show clearly that *Thaumaphrastus karanisensis* Blais. is identical with *Thorictodes heydeni* Reitt., 1875. A comparison of the description with those of Reitter (1875, Coleopt. Hefte 14: 54; 1881, Verh. z. b. Ges. Wien 31: 88) and Ganglbauer (1899, Käf. Mitteleur. 3: 765) and of the figures of the adult with that of the pupa (Emden 1924, Treubia 6: 6)[1] and with a slide in my collection exclude any doubts, and similarly the descriptions of the larvae by Anderson and myself (l.c.) confirm the identity. The only discrepancies are that according to Anderson the adult has no eyes whilst Ganglbauer describes indistinct small eyes, and that my description of the larva speaks of one-segmented labial palpi, whilst these are two-segmented according to Anderson, and that my description does not mention the mandibular prostheca figured by Anderson. It would appear from a slide of the head of the adult that small not convex and not prominent eyes are present. It is

[1] For obvious reasons I did not see the proofs of that paper, and I therefore use this opportunity for stating that the last line of the second paragraph on p. 2 should read "Graf v. Vitzthum in München freundlichst als *Urodinychus* (*Gitodinychus*) *faber* Berl. bestimmte."

somewhat uncertain whether these faceted areas really represent eyes, and the late K. M. Heller (i.l.) considered the species which I have as blind. The prostheca of the larval mandible cannot be traced with certainty in the undissected exuvia, which is the only larval material in my possession, but it may very well be present, and I have now satisfied myself that the labial palpi are two-segmented as described by Anderson.

Since I described the larva of *Thorictodes* that of *Thorictus* has also become known (Reichensperger 1925, Verh. naturh. Ver. preuss. Rheinl. 82: 102), and especially the figure of the maxilla with its chitinous spatulate inner lobe seems to prove, like Ganglbauer's comparison of the adults, that *Thorictodes* and *Thorictus* are indeed closely related.

There only remains the systematic position of the Thorictidae to be discussed. Earlier authors placed them either near Histeridae or in Clavicornia, and Ganglbauer considered them as closely related to the Lathridiidae and Colydiidae. In 1924 (the paper was written in 1922) I was uncertain whether to place them in Clavicornia or near Tenebrionidae or near Cisidae and Anobiidae, but in subsequent papers (1924, Jahresber. Caesar and Loretz 1924: 173–174; 1928, Ent. Blätt. 24: 11–12; 1942, Ent. month. Mag. 78: 268) I came more and more to consider them with the Cisidae as a group transitional between Clavicornia and the families related to Anobiidae. The characters which approach them to the latter group will be found in my 1928 paper. Among them the well-developed epicranial suture, the absence of a mandibular mola, and the presence of a spatulate inner lobe of the maxilla are of special importance. The prostheca might seem to contradict this view, but a very similar prostheca has also been discovered in Bostrychini by Gardner (1933, Ind. Forest Rec. Ent. 18, 9: 2) and Anderson (1939, Journ. Wash. Ac. Sci. 29: 382).

At first sight this relationship with the Teredilia (Bostrychoidea) appears to differ fundamentally from Anderson's classification of *Thaumaphrastus* as a subfamily of Dermestidae. However, apart from the straight body and strong sclerotization, this family has many characters in common with the Teredilia, so many in fact that in my key to the groups of families (1942: 22) I found it necessary to fit special clauses into paragraphs 11 and 12 for separating the Dermestid part of the Dascilloidea from the Teredilia ("the inner lobe sometimes smaller with . . . spurs . . ., the tergites in this case well sclerotized" for the Dermestidae, and "or with the inner lobe ending in, or consisting of, a spur, and the tergites not sclerotized" for Thorictidae, Lyctidae, most Anthribidae, etc.). It thus

depends only on the point where the border line is to be drawn. By using the orthosomatic or cyrtosomatic shape instead of the unsclerotized integument the Thorictidae could easily be shifted from the Teredilia to the Dascilloidea. Alternatively the Dermestidae with their spurred inner lobe might be excluded from Dascilloidea and joined to the Teredilia. At any rate the relationship between Dermestidae, Thorictidae and Teredilia appears to be very real. In Böving and Craighead's phylogenetic conspectus (1931, Ent. Americ. (N.S.) 11, pl. 125) the Bostrychoidea and Platystomoidea are derived from the Cleroidea, obviously by way of the Dermestidae, which these authors include in Cleroidea. The relation between Dermestidae and Teredilia in the adult stage has been discussed by Crowson (1938, Trans. R. Ent. Soc. Lond. 87: 406; 1944, l.c. 94: 298–299), and the male copulatory organs of Dermestidae and Ptinidae (p. 529) and *Ptinus* and *Lyctus* (p. 534) have been stated by Sharp and Muir (1912, Trans. Ent. Soc. Lond. 1912) to be closely related, whilst that of Thorictidae resembles Lyctidae (Emden 1928: 12) and Dermestidae (Anderson 1949: 126).

The intermediate phylogenetic position of the Thorictidae between Dermestidae and Teredilia is thus evident in both the larval and adult stages. As *Thorictodes* and *Thorictus* together are sufficiently distinct, it is hardly necessary to unite the family either with Dermestidae or with one of the families of the Teredilia, and there only remains the problem to be solved whether the Dermestidae should be separated from the other Dascilloid (or Cleroid) families and united with the Teredilia, or whether the latter should be amalgamated with the Dascilloidea, or whether the relationship of the Dermestidae with the Dascilloidea is closer, so that they should be left in that group forming just the connecting link with one of the neighbouring groups, the Teredilia. It appears to me that this course is perhaps preferable on the basis of the available evidence. With regard to the Thorictidae the choice would then be whether to join them to the Dascilloidea or to the Teredilia, and the relations with the latter would appear to be closer.

A KEY TO THE NYMPHS OF MIDWESTERN LYGAEIDAE (HEMIPTERA: HETEROPTERA).

By James A. Slater, Ames, Iowa.

The immature stages of Nearctic Hemiptera have been neglected to a considerable extent by most workers on the order. This neglect may have a two-fold origin. First, is the untenable belief that in paurometabolous orders the nymphal and adult stages may be identified through the use of adult characters. While this is occasionally true one has only to examine a nymph of, say, *Paromius longulus,* to see that the use of adult characters would be insufficient even to place the species in the correct tribe. The second reason for the neglect of the nymphal stages has been the necessity for special methods of preservation, usually considered burdensome by the conventional collector.

Due to the lack of adequately preserved material the key presented below is incomplete. Twenty-six genera are keyed, two of which, *Paromius* and *Oxycarenus,* are extra-limital for the upper Mississippi Valley region. The key is based upon nymphs of the fifth, or ultimate, instar there being insufficient material available of the earlier instars to make analysis of them possible at the present time. In all of the subfamilies except the Oxycareninae and Rhyparochrominae the key includes all genera likely to be found in the area. In the Oxycareninae no nymphs of the American genus *Crophius* have been available. However, I have included in the key the type genus *Oxycarenus,* as represented by an African species, in the hope that our genus may run close to it. The large subfamily Rhyparochrominae is very inadequately represented. Nymphs of only ten of the some twenty-two midwestern genera have been available to me for study. Therefore this section of the key will be of limited value until it becomes possible to subsequently expand it.

The recognition of instars is an important factor in working with immature forms. The instars of hemipterous nymphs, in general, are rather easy to recognize due to the remarkable constancy of the development of the wing pads throughout nymphal life. In the first and second instars the wing pads are absent and I have not been able to arrive at a generalization that will separate these from one another. In the first instar the head and antennae are always, so far as I know, much larger relative to the thorax and abdomen than is the case in the second instar. Furthermore, in several species examined the pro-thorax is larger relative to the

two succeeding segments than is the case in the second instar (Figures 1 and 2). Therefore, when a series representing five stages of the same species is at hand the first and second instar nymphs can usually be readily separated from one another. The following key to the instars is adapted from a paper on the nymphs of *Catorhintha mendica* (Slater 1943) and will work for immature Lygaeidae and for members of a number of other families as well. Nearly all hemipterous species pass through five instars during nymphal development.

KEY TO THE INSTARS.

1. Mesothoracic wing pads absent (Figs. 1 & 2) .. INSTARS I & II
   Mesothoracic wing pads present 2
2. Mesothoracic wing pads not extending caudad to the posterior margin of the metanotum (Fig. 3) .... INSTAR III
   Mesothoracic wing pads extending caudad onto the abdominal tergum 3
3. Mesothoracic wing pads not extending caudad to the posterior margin of the second abdominal tergite (Fig. 4). INSTAR IV
   Mesothoracic wing pads extending caudad at least onto the third abdominal tergite (Fig. 5) .... INSTAR V

Preservation: To obtain satisfactory specimens liquid preservative is necessary. I have found for most species that killing in a K.A.A.D. mixture, as described by Peterson (1948) is very satisfactory. Specimens should be removed from the mixture in a few hours and placed in either 70 or 95% ethyl alcohol. Adequate results may usually be obtained also by dropping specimens directly into alcohol to which a little formalin has been added.

In most cases nymphs of only certain species of a given genus have been available for study. I have indicated below the half couplet, where a genus is keyed out, what species have been studied of that genus.

KEY TO THE GENERA OF KNOWN FIFTH INSTAR NYMPHS OF MIDWESTERN LYGAEIDAE.

1. Three abdominal scent gland openings present, one each on anterior margins of tergites four, five, and six 2
   Two abdominal scent gland openings present, one each on anterior margins of tergites four and five, or five and six. 14
2. Basal segment of hind tarsus longer than apical segment .. 3
   Basal and apical segments of hind tarsus subequal, or apical segment longer than basal 12

3. Antennal segments two and three subequal (*L. diffusus* (Uhler)) .... LIGYROCORIS Stal.
   Antennal segment two longer than segment three 4
4. Epicranial stem (coronal suture) longer than either arm (*M. serripes* Olivier) .... MYODOCHA Latr.
   Epicranial stem shorter than either arm, or lacking 5
5. Basal segment of hind tarsus more than twice length of apical segment 6
   Basal segment of hind tarsus less than twice length of apical segment 7
6. Length of second antennal segment one-fourth or more greater than width of head across eyes; length of pronotum much more than three-fourths length of mesothoracic wing-pads (*C. mavortius* (Say)) .... CNEMODUS H.S.
   Width of head across eyes greater than length of second antennal segment; length of mesothoracic wing pads more than one-fourth greater than length of pronotum (*S. insignis* (Uhler)) .... SPHAEROBIUS Uhler
7. Length of second antennal segment more than twice the width of the interocular space (*O. picturata* Uhler). OZOPHORA Uhler
   Length of second antennal segment less than twice the width of the interocular space 8
8. Transverse constriction on basal one-fourth of pronotum, very weak or lacking, not attaining the lateral margins, exclusive of the explanate edge (*U. floralis* (Uhler)). UHLERIOLA Horv.
   Transverse constriction on basal one-fourth of pronotum always attaining the lateral margins, exclusive of the explanate edge 9
9. Fourth antennal segment never more than twice the length of segment one (*H. plebejus* Stal) .... HERAEUS Stal.
   Fourth antennal segment always considerably more than twice the length of segment one 10
10. Length of abdomen from apex of mesothoracic wing pads to apex of abdomen subequal to, or greater than length of pronotum and mesothoracic wing pads combined (*P. longulus* (Dallas)) .... PAROMIUS Fieb.
    Length of abdomen from apex of mesothoracic wing pads to apex of abdomen only slightly more than one-half length of pronotum and mesothoracic wing pads combined. (Note: This character may or may not separate *Paromius* from some of the more elongate species of *Pachybrachius* from the southern states) 11

11. Length of second and fourth antennal segments subequal; rostrum extending caudad at least to the mesocoxae (*P. constrictus* (Say)) . . . . PERIGENES Distant
    Fourth antennal segment one-third longer than segment two; rostrum short, not extending caudad past the front coxae (*P. basalis* (Dallas)) . . . . PACHYBRACHIUS Hahn.
12. First and second antennal segments subequal in length (*S. thomsoni* Reuter) . . . . SCOLOPOSTETHUS Fieb.
    Second antennal segment longer than first segment (9:7) 13
13. Second and third antennal segments subequal in length, the third segment somewhat clavate in form (*P. nodosa* Say). PTOCHIOMERA Say
    Second antennal segment one-third longer than segment three, the third segment linear (*K. resedae* (Panzer)). KLEIDOCERYS Stephens
14. Fore femora swollen and armed below with short teeth . . 15
    Fore femora only slightly, or not at all, swollen, not armed below with teeth 17
15. First antennal segment longer than second; head, pronotum and mesothoracic wing pads coarsely punctate (*O. dorsalis* (Say), *O. crassimana* (Fabricius)). OEDANCALA A. & S.
    First antennal segment shorter than second; head, pronotum and mesothoracic wing pads impunctate 16
16. Rostrum long, reaching caudad onto second abdominal sternite (*Oxycarenus* sp.) . . . . OXYCARENUS Fieb.
    Rostrum short, not extending caudad to the middle coxae, usually barely exceeding the front coxae (*P. abbreviatus* (Uhler)) . . . . PHLEGYAS Stal
17. Suture between abdominal tergites four and five and five and six curving strongly caudad from lateral margins to meson 18
    Suture between abdominal tergites four and five and five and six straight, or only very slightly curving caudad to the meson 19
18. Eyes very prominent, not in contact with antero-lateral margins of pronotum; interocular space at most two and one-half times width of an eye; pronotum black with vertex dull testaceous (*H. piceus* (Say)). HYPOGEOCORIS Mont.
    Eyes less prominent, usually in contact with the antero-lateral margins of pronotum; interocular space three times width of an eye; pronotum variously colored, if black then the

vertex of the head concolorous (*G. uliginosus* (Say), *G. punctipes* (Say), *G. bullatus* (Say)) .... GEOCORIS Fall.

19. Length of third antennal segment greater than interocular space (*O. fasciatus* (Dallas)) .... ONCOPELTUS Stal

Interocular space greater than length of third antennal segment 20

20. Epicranial stem (coronal suture) absent; arms meeting mesally at base of head. (In dried specimens care must be taken to see that the head has not been retracted into the pronotum making the base of the head invisible) 21

Epicranial stem present, arms meeting anterior to base of head 23

21. Rostrum very long, reaching caudad at least to the second abdominal sternite (*B. numenius* (Say)). BELONOCHILUS Uhler

Rostrum much shorter, never exceeding the hind coxae and often only slightly surpassing the middle coxae 22

22. Pronotum conspicuously striped longitudinally with dark markings (*N. ericae* (Schilling), *Nysius* spp.). NYSIUS Dall.

Pronotum heavily mottled, but never with conspicuous longitudinal striping (*O. scolopax* (Say)). ORTHOLOMUS Stal

23. Lateral margins of abdomen scalloped (*C. angustatus* Stal, *C. luridus* Stal, *C. discors* Horv., *C. robustus* Barber). CYMUS Hahn

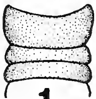
Lateral margins of abdomen not scalloped 24

24. Body slender, elongate, not ovoid; three apical abdominal tergites more darkly colored and appearing more heavily sclerotized than the preceding tergites (*I. falicus* (Say), *I. macer* Van Duzee) .... ISCHNODEMUS Fieb.

Explanation of Plate I

All figures are of *Cymus angustatus* Stal. Fig. 1. Thoracic segments of first instar nymph. Dorsal view, × 36. Fig. 2. Thoracic segments of second instar nymph. Dorsal view, × 36. Fig. 3. Thoracic segments of third instar nymph. Dorsal view, × 36. Fig. 4. Thoracic segments and first abdominal segment of fourth instar nymph. Dorsal view, × 36. Fig. 5. Thoracic segments and three proximal abdominal segments of fifth instar nymph. Dorsal view, × 36.

BULL. B.E.S. VOL. XLVI PLATE I



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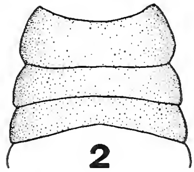

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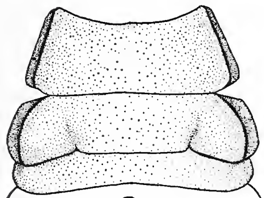

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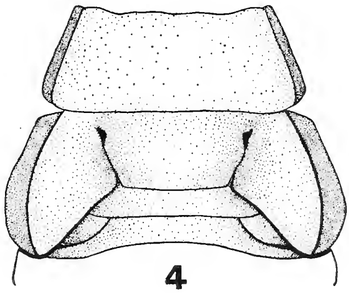

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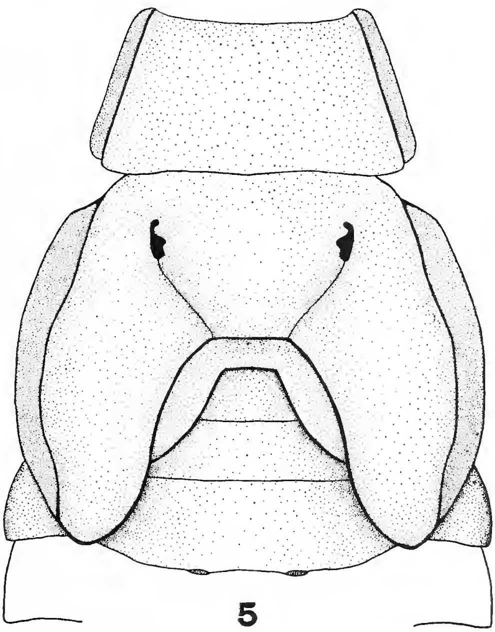

5

Body more robust, not slender and elongate; apical abdominal tergites not more darkly colored nor more heavily sclerotized than preceding tergites 25

25. Spiracle of abdominal segment seven dorsally located (*L. kalmii* Stal, *Lygaeus* spp.) .... LYGAEUS Fabr.

Spiracle of abdominal segment seven ventrally located (*B. leucopterus* (Say), *B. iowensis* Andre, *Blissus* spp.). BLISSUS Burm.

Acknowledgments.

The writer wishes to thank Dr. R. I. Sailer, Mr. H. G. Barber and Mr. C. F. W. Muesebeck of the United States National Museum for the loan of specimens from the museum collections; Mr. R. C. Froeschner for the loan of valuable material from his personal collection; Dr. W. P. Hayes of the University of Illinois under whose guidance a problem on the nymphs of Lygaeidae was inaugurated; Dr. H. M. Harris of Iowa State College for a number of helpful suggestions and for making facilities available.

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NOTICE

The Department of Engineering Physics of Cornell University, Ithaca, New York will give a special course in "Techniques and Applications of the Electron Microscope" from July 9 to July 21, 1951.

The course is designed for those research workers who have recently entered the field of electron microscopy. Further inquiries should be addressed to Professor Benjamin M. Siegel, Rockefeller Hall, Cornell University, Ithaca, New York.

HIPPOBOSCIDAE (DIPTERA) TRANSPORTED BY AIRCRAFT.

By JOSEPH C. BEQUAERT, Cambridge, Mass.

During the past fifteen years many observations have been made showing the ever increasing importance of aircraft as a new human agency in the spread of insects throughout the world. Recently I had the opportunity to examine some hippoboscid flies intercepted on planes by Quarantine officers on the Atlantic seaboard as well as in the Pacific. Considering the specialized habitat of these insects and their relative scarcity, their rather frequent occurrence on aircraft is surprising and worthy of some attention.

A first series of flies, obtained by the officers of the U. S. Public Health Service at Miami, Florida, in 1944, consists of 8 specimens belonging to 3 species. They were found on 7 military Air Transport planes arriving from overseas.

1. The pigeon fly, *Pseudolynchia canariensis* (Macquart), was found on 4 occasions: (a) April 1, one dead fly on a plane from Agra (India) via Borinquen (Puerto Rico); (b) August 28, 2 live flies on a plane from Trinidad, which had carried pigeons; (c) September 25, 1 dead fly on a plane from Natal (Brazil) via Borinquen; (d) December 21, 1 dead fly on a plane from Natal via Borinquen.

2. *Hippobosca variegata* v. Mühlfeld: July 19, 1 dead fly on a plane from Casa Blanca (Morocco) via Bermuda.

3. *Olfersia aenescens* Thomson was found on 2 occasions: (a) September 28, 1 dead male on a plane from Atkinson Field (near Georgetown, British Guiana) via Borinquen; (b) October 4, 1 dead male on a plane from Accra via Borinquen.

A second series of flies, taken from 4 commercial planes at Midway Island, in the Pacific, consisted of one species only, *Olfersia aenescens:* (a) November 9, 1937, 1 fly on an eastbound China clipper; (b) December 2, 1937, 1 fly on an eastbound China clipper; (c) February 12, 1938, 1 fly on an eastbound Hawaii clipper; (d) December 27, 1939, 1 fly on an eastbound Hawaii clipper.

In addition I have seen at the U. S. National Museum a specimen of *Olfersia aenescens* taken on a commercial plane arriving at San Francisco, California, from across the Pacific; also a male of the same species found at Guam, Marianas, on a Philippine clipper, December 17, 1938, by R. G. Oakley.

Olfersia bisulcata Macquart is the common louse-fly of American vultures. A specimen of this species, at the U. S. National Mu-

seum, was taken at Brownsville, Texas, in the cabin of a plane arriving from Mexico, June 8, 1947.

In the case of the pigeon-fly, its presence on military aircraft was no doubt due to the planes also transporting domestic carrier pigeons, which in tropical and subtropical countries are usually infested with this parasite. It is now nearly cosmopolitan and is already well established in many parts of the United States.

Hippobosca variegata, more often called *Hippobosca maculata* Leach, is a parasite of cattle and horses in many tropical and warm temperate parts of the Old World. It is by no means rare in North Africa. As it is a powerful and active flier, its occurrence on board a plane coming from Morocco is not wholly unexpected.

The presence of *Olfersia aenescens* on eight planes, both in the Atlantic and the Pacific, is of much greater interest. This is a regular parasite of several kinds of marine fish-eating birds, so-called "swimmers" of the three orders Procellariiformes, Pelecaniformes and Charadriiformes: albatross, shearwaters, petrels, boobies, tropic-birds, noddies and other terns. All these birds often occur in populous colonies, either roosting or nesting, preferably on rocky islets or small oceanic islands. The flies are found on the nestlings as well as on the adult birds. Dr. J. P. Chapin points out to me that places where sooty terns (*Sterna fuscata*), one of the known hosts of *O. aenescens,* nest are just the kind of open, flat spaces where airstrips are likely to be located. During the last war, sooty terns were in the habit of coming in at dusk to roost and eventually would start nesting near the end of runways on the airfield at Ascension Island, the stopping point of planes crossing from Accra to Brazil. They were a serious problem there because they would rise in a cloud ahead of the planes (see Dr. Chapin's article in Natural History, New York, 55, pp. 313–319, 1946). Sooty terns behaved the same way on the airfield at Johnston Island and probably elsewhere in the Pacific. The close proximity to certain airfields of colonies of sooty terns or other hosts readily accounts for *O. aenescens* entering planes stopping at such places, while they were standing open. It is, moreover, not altogether unthinkable that when a closed plane hits a dense flock of birds, killing some in the process, flies might alight on the outside of the moving aircraft and one of them eventually find its way inside through some small opening. The flattened body and the habit of sliding beneath feathers easily allow a hippoboscid's entering even narrow interstices.

The flies from Miami mentioned above were collected by Dr. W. W. Wirth, and I was able to study them through his courtesy

and that of Mr. John E. Porter. I am indebted to Dr. John H. Hughes, Chief, Entomology Branch, Division of Foreign Quarantine, U. S. Public Health Service, for permission to publish these records. The flies from Midway Island, obtained by Mr. F. C. Hadden, were seen at the Experiment Station of the Hawaiian Sugar Planters' Association, in Honolulu, through the kindness of Mr. C. E. Pemberton.

The presence of hippoboscid flies on aircraft was first reported by F. G. S. Whitfield in 1939 (Bull. Ent. Res., 30, p. 412). He found at the airport of Khartoum, Anglo-Egyptian Sudan, during 1935, 1936 and 1937, in all five specimens on as many planes. In three cases the species was *Hippobosca variegata;* in one case, *Hippobosca camelina* Leach, a specific parasite of camels and dromedaries; and in one case the fly was not identified. The planes all came from African localities, either in South Africa or Eritrea.

Notes on Heliothiinae—More recent records of Rare Species: Many Heliothiinae are highly local in distribution and often occur at seasons of the year when collectors may not be in the field. While taken at lights many of these moths are also day flyers, commonly associated with flowers, especially composites, in meadows, open woodland and desert areas. Attention is called to the following records in recent years with the thought that they may lead to a better representation of the species indicated.

Melicleptria antonio Smith: Described in 1906 from a unique male, captured at San Antonio, Texas in April, and also reported from Brownsville. Specimens taken by Otto Buchholz in the lower Rio Grande Valley at Pharr, Texas in late March, 1948.

Eupanychis scissoides Benj.: Described in 1935 from a pair taken at St. Petersburg, Florida in October, and recorded from Myrtle Beach, So. Car. in late September. A specimen taken by Dr. A. B. Klots at Winter Park, Florida in September, 1946.

Dasyspoudaea zuni McE.: Type locality Black Rock, Zuni Pueblo, New Mexico, in late July, 1948. Two specimens taken by Leslie Banks on July 29, 1949 at Chambers, Arizona and Amarillo, Texas respectively.

Grotella soror B. & McD.: Described in 1912 from a unique female taken at Redington, Arizona. Specimens taken by Lloyd Martin in late August, 1949, in Madera Canyon, Santa Rita Mts. of southern Arizona.—Rowland R. McElvare, Port Washington, Long Island, N. Y.

BOOK NOTES

A Field Guide To The Butterflies, by Alexander B. Klots. xvi + 349 pp., 247 color paintings, 232 photographs and 8 text figures. $4\frac{1}{2} \times 7\frac{1}{2}$ ins., cloth bound. 1951. Houghton Mifflin Company, Boston, Mass. (Price, $3.75.)

This excellently illustrated newest addition to the Field Guide Series, weighing less than fourteen ounces, is a comprehensive treatise in which one can find a wealth of general information dealing with butterflies as well as complete data concerning those species which are resident to that portion of North America east of the Great Plains.

The subject matter is broken down into three main categories as follows, (1) general information concerning butterflies, (2) a consideration of the resident species of North America found east of the 100th meridian and (3) appendices covering a variety of subjects.

The introductory part is of a general nature and includes chapters describing Collecting and Preserving Specimens, The Butterfly and its Environment, Life Histories and Growth, The Adult Butterfly and Butterfly Classification. The greatest attention is given to the subject of the butterfly and its environment and such items as geographic and climatic regions, environments and habitats, geographic variation, conservation, protective form and coloration and butterfly behavior are discussed.

In the second part all of the butterflies known to breed in Eastern North America are described while others of casual or accidental occurrence and those believed wrongly recorded are treated in a special subsection.

Special mention should be made of the excellence of the color paintings and photographs which illustrate this part of the Guide. Two hundred and forty-seven species are represented by color paintings by Miss Marjorie Statham of the American Museum of Natural History. Even with the inevitable loss which accompanies reproduction, these paintings have retained their superior quality. The photographs which number two hundred and thirty-two are by Mrs. Florence Longworth and are outstanding in their clarity and tone.

The descriptions which accompany the illustrations in this portion of the Guide are clear and concise. In addition, there are notes concerning similar species, the features of the larva and information concerning food habits, the range of the species and accounts of subspecies. Naturally the amount of information varies with the

species under consideration but one can sense that all pertinent data are included.

The third part is made up of appendices covering Some Principles of Classification, Butterfly Literature and Collections and a Checklist of Butterflies and Skippers. These are followed by indices to Technical Terms and General Subjects, Larval Food Plants and to the Butterflies of Eastern North America.

This Guide is packed full of useful information arranged in a superlative manner. Because of its over-all general excellence, it is impossible to select any one section as being outstanding. Each reader will find certain sections which particularly appeal to him, yet there is not a single paragraph which does not contain essential information concerning the subject. Klots is to be congratulated for a job well done.—George S. Tulloch, Merrick, New York.

A New Cockroach Record for the United States: On June 21, 1948, I collected in East Falmouth, Massachusetts, two male cockroaches. Doctor A. B. Gurney kindly determined them as *Ectobius lividus* (F.). He states, "*Lividus* is widespread in the warmer parts of Europe and elsewhere adjacent to the Mediterranean Sea, extending at least to Algeria and Tunisia in Africa, to southern England, and is apparently found throughout France. It is said to be common in the woods." According to Dr. Gurney this is the first record of this species occurring in the United States. During the summer of 1949 I noticed many more in the base of Swiss chard plants. In early September, 1950, I collected in East Falmouth many females and nymphs. During the daytime the nymphs and a few adults were taken from under loose lichens and bark on oak trees, however, the majority of the adults were found under boxes and baskets, in rolled up paper, etc. At night the roaches became active, moving around on tree trunks, where they were easily found by running the beam of a flashlight up and down the trunks. During the captivity of several females, two oötheca were deposited, which were preserved. The locality is in a wooded section near a tidal river on Cape Cod. A series is in the collection of the U. S. National Museum, while the rest are in the collection of the writer.—Oliver S. Flint, Jr., Amherst, Mass.

ADDITIONS TO VESPINE BIOLOGY VII: ORIENTATION FLIGHT.

By Albro T. Gaul, Brooklyn, New York.

Of all the phenomena associated with the behavior of the social insects, that of orientation is one of the most interesting. The discussion of orientation in this paper will be restricted to the learning of the nest site, either by the young worker or upon the occasion of the removal of the nest to a new locus.

Just after the teneral phase, the young ergate normally makes an orientation flight before becoming actively engaged in any outdoor activity. This flight usually occurs about mid-morning. This orientation flight pattern is the same among all species which the author has had under observation, (*Vespula maculifrons* Buy., *V. rufa* var. *vidua* Sauss. and var. *consobrina* Sauss., *V. squamosa* Drury, *Dolichovespula arenaria* F. and *D. maculata* L.). In this flight the ergate flies straight from the nest entrance for about ten inches, she wheels about in an abrupt 180° turn, so she is facing the nest, then she sweeps from side to side in an ever increasing arc starting with a sweep of nearly 90° (45° each side of the nest entrance). After about 20 of these side sweeping flights, during which the distance from the nest has increased from ten inches to thirty inches and during which the angle of sweep has expanded from 90° to nearly 280°, the wasp flies quickly back into the nest. During this first flight, there is a less perceptible but albeit important vertical motion whose amplitude seldom exceeds 20 inches. The duration of this first flight is close to 15 seconds.

Immediately after the wasp enters the nest she emerges and resumes the three dimensional sweeping course, but this time she increases the distance from the nest with each sweep in such a way that at the end of another 20 sweeps she has moved 25 or 30 feet from the nest. Frequently this second flight culminates in an abrupt flight to the field; but more often it is followed by a return to the nest, in which case flight three becomes a repetition of flight two and nearly always ends with the flight to the field. This is the standard orientation behavior of the young worker among the species listed.

The implication is clear from this behavior pattern that the wasp has some mechanism of flight navigation to within 20 or 30 feet of the nest, and that from this distance to the nest it must rely upon the recognition of landmarks. It is probable that the method of flight navigation is a form of "light compass" navigation as found

among other Hymenoptera. Santschi (1) and Schneirla (2) have shown that ants are guided to their nests by the position of the sun. Since ants are terrestrial, much significance is ascribed to navigation by "scent trails." Among the flying insects, such scent trails are impossible and light compass navigation would be difficult on cloudy days. That this is actually the case has been shown by Wolfe in studies on navigation in the honeybee (3).

The learning of landmarks is a remarkably quick process. The wasp returning from her first foraging flight usually makes several horizontal sweeping flights until the nest is located. Thereafter she flies directly to the nest. Her efficiency in locating the nest increases until by the end of five to twelve flights she makes no sideways flights but enters the nest directly from the field.

It is normal for young workers to thus engage in orientation flights prior to foraging. When an entire populated colony is removed to a new location, it is not a normal colony happening and is caused entirely by the inquisitiveness of the entomologist. On such occasions the entire ergate population of the nest makes a new set of orientation flights in order to readjust to the new location. In this case the procedure of orientation is a replication of the orientation flight of the young worker, and requires the same hesitant returns before the new nest site is precisely memorized. The time required for this new learning is the same as that for learning the original location, from 100 to 300 seconds.

It can thus be concluded that Vespine wasps can memorize a group of landmarks by sight, and that in very few experiences they can utilize this information without hesitation.

An understanding of the mechanisms which inaugurate an orientation flight is not difficult. Although the moving of the nest site is a singular wasp experience, orientation flights, per se, are of everyday occurrence. Whenever the wasp enters a new foraging area there is a certain amount of orientation before the return trip is undertaken. Apparently orientation flights are initiated in response to unfamiliar landmarks at the site of activity. This applies at the nest site as well as in the field. There are innumerable citations in the literature of wasps orienting themselves to their prey by memorizing the position of the observer. Similar experiences are within the author's observations. Many times when the author has stood quietly in front of the nest, the young workers have memorized his position. When he stepped away a few feet, the returning worker tried to locate the nest in the same position relative to the author, becoming much agitated when the nest was not there. In such circumstances, the wasp immediately resumes a reorienta-

tion procedure like the first flight, usually terminating in the recognition of some other landmark and the eventual location of the nest.

A peculiar problem is presented in the habits of the young queens. The young virgin queens leave the nest about a week after emergence from the cocoon. When they leave the nest they make no attempt to orient themselves with the mother nest, although they are presented with new landmarks outside. Of course, these queens do not return to the mother nest; they seek a mate on the nuptial flight, which is followed by hibernation. Upon the advent of spring they build their own nests, yet they must orient themselves with their own new nests! Clearly these young queens must be so constituted that the dominance of one instinct can completely negate the behavior associated with another instinct.

It may be concluded that orientation is a response to unfamiliar landmarks, and that it applies at all times, regardless of the age of the workers. That young queens do not orient when leaving the parent nest. That orientation procedure is much alike regardless of species or circumstance. That wasps returning to the nest may navigate by light compass until they are guided by familiar landmarks.

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1. **Santschi, F.** 1911. Orientation of Ants. Rev. Suisse Zool. Vol. 19, pp. 303–338.
2. **Schneirla, T.** 1929. Learning and Orientation in Ants. Comp. Psych. Monographs Vol. 6, No. 30.
3. **Wolfe, E.** 1926. Orientation of Bees. Z. Vergl. Physiol. Vol. 3, pp. 615–691.

Spotted Asparagus Beetle Invades Utah: The asparagus beetle, *Criocerus asparagi* (L.), has been a pest of asparagus in northern Utah since 1938, being first observed in the southern part of Weber County and the northern part of Davis County. During 1950, the twelve-spotted asparagus beetle, *Criocerus duodecimpunctata* (L.), was collected in numbers at Ogden, Utah, by both Louis E. Fronk and Gerald L. Dean, from their own back yards. A pest or two seems to be found nearly every season, new to Utah. —G. F. Knowlton, Logan, Utah.

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CONTENTS

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SOME NEW SPECIES OF MEXICAN ALCONEURA (HOMOPTERA—CICADELLIDAE).

By Dwight M. DeLong and Robert F. Ruppel, Columbus, Ohio.

The Genus *Alconeura* was erected by Ball and DeLong[1] in 1925 at which time five species were referred to that group and *rotundata* Ball and DeLong was cited as the genotype. Since that time two species were described by Lawson[2] in 1930, two by Beamer[3] in 1934, nine by Griffith[4] in 1938, when he reviewed the genus, and one by Knull[5] in 1945. Twenty-one species are now listed as belonging to this genus for the United States. The larger number of species has been described from the southwestern United States and the range of some of these extends into portions of Mexico. An examination of the Mexican material has revealed several new species; six of which are being named at this time. The types of all species described are in the DeLong collection.

Alconeura languida n. sp.

Figs. 1a, 1c, 1e, 1f.

Resembling *planata* Ball and DeLong in general form and coloration, but with distinct genitalia. Length 2.8 mm.

Vertex produced, bluntly angled in female, more rounded in male, median length almost as long as basal width between the eyes in the female, median length about two-thirds as long as the basal width between the eyes in the male.

[1] Ball, E. D. and DeLong, D. M. 1925. Anns. Ent. Soc. Amer. 18: 334–340.

[2] Lawson, P. B. 1930. Bull. Brooklyn Ent. Soc. 25: 44–46.

[3] Beamer, R. H. 1934. Can. Ent. 66: 16–18.

[4] Griffith, M. E. 1938. Univ. Kansas Sci. Bull. 24: 309–340.

[5] Knull, D. J. 1945. Ohio Jour. Sci. 45: 103.

Color: Vertex pale tan, with the margin and a narrow, median, longitudinal vitta white. Pronotum olive-green, margins broadly bordered with light tan. Scutellum orange-brown, the basal angles bordered with white. Elytra olive-green with the apices pale and with a round black spot in the base of the fourth apical cell. Face light and unmarked.

Genitalia: Female seventh sternite with the lateral angles of the posterior margins narrowed, the median half produced as a broad rounded lobe which is slightly, roundedly notched at the middle. Male aedeagus thick, heavy at the base, almost square; dorsal processes of the base short, erect, and prominent; a pair of dorso-lateral processes arise on the base proximal to the phalicata, paralleling the phalicata for two-thirds of its length; the phalicata erect, about one-half as wide as long, its apex broadly rounded, the posterior margin thickened to resemble a process for about two-thirds of the length of the phalicata. The apex of the style blunt, the outer margin of the style convex in ventral view. The pygofer hook long, thin, and sharply pointed, arising on the dorso-caudal margin of the pygofer, directed caudo-ventrally and curving outwardly.

Holotype male, allotype female, male and female paratypes collected at Acapulco, G'ro., Sept. 10, 1939, by DeLong and Plummer; male and female paratypes collected at Iguala, G'ro., Sept. 11, 1939, by D. M. DeLong; male paratypes collected at Zincauro, G'ro., Sept. 2, 1930, (M.F. 1789) and, Cutzmala, G'ro., Aug. 20, 1930, (M.F. 1768) by J. Parra; male paratype collected at Huetamo, Mich., Aug. 22, 1933, (M.F. 3100) and a female paratype collected at Joiulla, Mor., Oct. 2, 1937, (M.B. 3912) by Dr. Dampf.

Alconeura separata n. sp.

Figs. 2a, 2b, 2c, 2f.

A unique species which is stouter than the other described species of *Alconeura* and which superficially resembles a species of *Protalebra*. Length 3 mm.

The vertex is produced, bluntly angled, and the median length is about equal to the basal width between the eyes in the female while somewhat shorter in the male. The head, including the eyes, is subequal in width to the pronotum, and the face in lateral view recedes sharply below the eyes.

Color: The vertex and pronotum cream marked along each side with a reddish-orange area which covers all but the posterior margin and a broad median region of the pronotum and which extends onto the vertex as a broad rectangular area next to each eye; a

small stripe on the pronotum next to the posterior corner of each eye orange-red. The face is cream, unmarked. The scutellum is orange-red with the basal angles outlined with cream. The elytra are white with a broad transverse stripe on the proximal quarter of the clavus, a broad stripe extending transversely from the proximal third of the costal margin to the middle of the claval suture, and a broad stripe extending from the middle of the costal margin to the apex of the clavus, orange-red; the cross veins and the veins of the first two apical cells are bordered with fuscous.

Genitalia: The female seventh sternite has the posterior margin concavely then convexly rounded to form a produced lobe which is rounded at the apex. The base of the aedeagus of the male is long, straight, and erect; the dorsal processes of the base are long, thin, and prominent, the phalicata is as long as the base, and curves slightly toward the dorsum, narrowing to one-third its basal width at its rounded apex; a pair of deflected, diverging, processes about one-third the length of the phalicata arise laterally at the apex of the phalicata. The styles in ventral view are bulbous near the tip, the apex is produced to form a long pointed process, and the outer margin of the distal portion bears a row of long hairs. The pygofer hooks are thick and heavy; they divide near the apex into sharply pointed dorsal and ventral processes, the dorsal process is directed caudally while the ventral process is directed ventro-caudally.

Holotype male and allotype female collected at Iguala, G'ro., Oct. 25, 1941, by DeLong and Good; female paratypes collected by the same collectors at Chilpancingo, G'ro., Oct. 25, 1941.

Alconeura rubranota n. sp.

Figs. 3a, 3b, 3c.

A rather unique species resembling *rotundata* Ball and DeLong in general form but differing in coloration and genitalia. Length 3 mm.

The vertex of the male produced with the anterior margin rounded and with the median length about as long as the basal width between the eyes.

Color: The vertex cream, with paired, adjacent spots on the anterior and posterior portions of the vertex and spots on the inner margin of each eye orange-brown. The pronotum light cream, with a broad, darker band on the anterior margin, and a pair of median spots on the band golden brown. There are a pair of light orange spots on the disk and a small, light orange stripe near each lateral angle. The scutellum light tan with the basal angles and

apex slightly darker. The elytra white translucent, with a pair of spots on the clavus, three spots along the second sector, and a spot on the first sector, orange; the cross veins and the veins of the apical cells bordered with fuscous; a large, round, black spot in the corner of the fourth apical cell.

Genitalia: The base of the aedeagus is bent dorsally near its center, the horizontal proximal portion swollen and the vertical distal portion cylindrical; the dorsal processes of the base are reduced to slight knobs; a ventral process arises at the bend of the base and curves dorsally, this process is about as long as the base; the phalicata is long, slender, and sickle-shaped (concave anteriorly) and tapers gradually to a blunt apex. The distal portion of the style in ventral view is narrowed rapidly to a pointed apex, with its lateral margins convex, and with a fringe of long hairs arising on the lateral margins. The pygofer hooks arise on the median interior surface of the pygofer and are divided near their bases into dorsal and ventral processes which are subequal in length; the dorsal processes thicker at the base than the ventral processes.

Holotype male collected at Finca Prusia, Chiapis, Nov. 4, 1932, M.F. 2846, by Dr. Dampf.

Alconeura cinctella n. sp.

Figs. 4a, 4b, 4c, 4d, 4f.

Resembling *separata* in general form and appearance but with the face in lateral view not so decidedly receding; the coloration and genitalia distinctive. Length 3 mm.

The vertex is produced, bluntly angled, and with the median length about equal to the basal width between the eyes in the female, but somewhat shorter in the male.

Color: The vertex is ivory and unmarked. The pronotum is white with the anterior margin and a pair of small, round spots on the disk, orange-red. Scutellum light yellow with the basal angles and apex orange. The elytra white, with a band at the base of the clavus, a broad stripe extending from the middle of the commissural suture across the clavus to the middle of the corium, and a small stripe on the proximal third of the costa, orange-red; a transverse stripe extending from the mid-costal margin to the apex of the clavus black; the area on the corium next to the apex of the clavus light orange; the apical veins bordered with fuscous. The color markings of the females are smaller and lighter than in the males.

Genitalia: The seventh sternite of the female with the median third strongly produced to a narrowly rounded apex. The base of

the male aedeagus short and thick; the dorsal processes of the base long, prominent, and reflexed at the apex; the pair of ventral processes of the base are long, thin and curve toward the dorsum, projecting for one-fourth of their length above the rest of the aedeagus; the phalicata thick, curving toward the dorsum and but little wider at the base than at its truncate apex; a pair of wing-like processes arise on the dorso-posterior margins at the apex of the phalicata, extend ventro-laterally and are about one-third the length of the phalicata. The apex of the style sharply rounded, its lateral margins in ventral view tapering toward the apex and bearing a row of long hairs on the outer margin. The pygofer hook bifid, with the dorsal and ventral processes widely separated, and about equal in length.

Holotype male, allotype female, and male and female paratypes collected at Iguala, G'ro., Sept. 11, 1939, by DeLong and Plummer; other male and female paratypes from Iguala, G'ro., October 25, 1941, (DeLong and Good). Paso de Vacas, G'ro., Sept. 3, 1930; Mezcala, G'ro., Aug. 4, 1930 (M.F. 1735); Arantichangus, G'ro., Aug. 31, 1930 (M.F. 1788); Pungarabato, G'ro., Aug. 22, 1930 (M.F. 1769); Tetela del Rio, Aug. 13, 1930, (M.F. 1757); P. de Ixtla, Mor., Aug. 30, 1930, (M.F. 1754) and Huetamo, Mich., Aug. 22, 1933, all collected by J. Parra. Paratypes from Chilpancingo, G'ro., October 25, 1941, by DeLong and Good.

Alconeura rubella n. sp.

Figs. 5a, 5b, 5c, 5d.

Resembling *quadrimaculata* Lawson in general form, but differeng in coloration and genitalia. Length 3 mm.

Vertex with the anterior margin of the male rounded, the median length about equal to the basal width between the eyes.

Color: The vertex is ivory, with a pair of median longitudinal vittae which fade out anteriorly and posteriorly, orange-brown, and with a pale tan spot near the inner margin of each eye. Pronotum cream, with paired, median and lateral, longitudinal vittae, dull orange. The median vittae fuse on the disk to form an enlarged spot. The scutellum cream with the basal angles and apex orange-brown. Elytra hyaline, with three spots along the clavus, an interrupted vitta which extends obliquely across the elytra from the humeral angle to the apex of the clavus, and a bar on the mid-costal region, orange. The cross veins and the veins of the first two apical cells are bordered with fuscous, a minute black spot is present in the base of the fourth apical cell.

Genitalia: The base of the aedeagus is bent nearly at right angles near its proximal end, the proximal portion broad and the erect distal portion cylindrical; a pair of long, slender ventral processes arise at the bend of the base, these curve dorsally near their bases and then extend straight dorsally exceeding the rest of the aedeagus by one-fourth of its length; the dorsal processes of the base are short and narrow; the phalicata curves gently dorsally, and tapers to one-half its basal width at the bluntly rounded apex. The apex of the style is pointed with the lateral margins of the distal portion, in ventral view, appearing almost straight. The pygofer hooks arise on the dorso-caudal angles of the pygofer, taper from a thick base to sharply pointed apices, which curve ventrally near their bases.

Holotype male collected at Vejuco, G'ro., Sept. 3, 1930, (M.F. 1790) by Dr. Dampf.

Alconeura similis n. sp.

Figs. 6a, 6c, 6e.

Resembling *tricolor* (Van Duzee) in general form and appearance but with distinct genitalia. Length 2.7 mm.

Vertex: Produced, bluntly angled, about as long as basal width between the eyes in the female, somewhat shorter in the male.

Color: Vertex orange-red, with the margin and median, longitudinal vittae white. Pronotum olive-green with the lateral angles and a median longitudinal vitta white, and with the anterior margin broadly bordered with orange-red. Scutellum orange in male, pale orange in female, basal angles bordered with white. Elytra olive-green with a row of pale spots on the clavus along the claval suture, scattered white spots on the clavus and corium. The tips of the longitudinal veins are white, and there is a round black spot in the corner of the fourth apical cell.

Genitalia: The base of the male aedeagus heavy and thick, its basal dorsal processes erect, long, and prominent; the phalicata erect, slightly curving dorsally and tapering from the base to its

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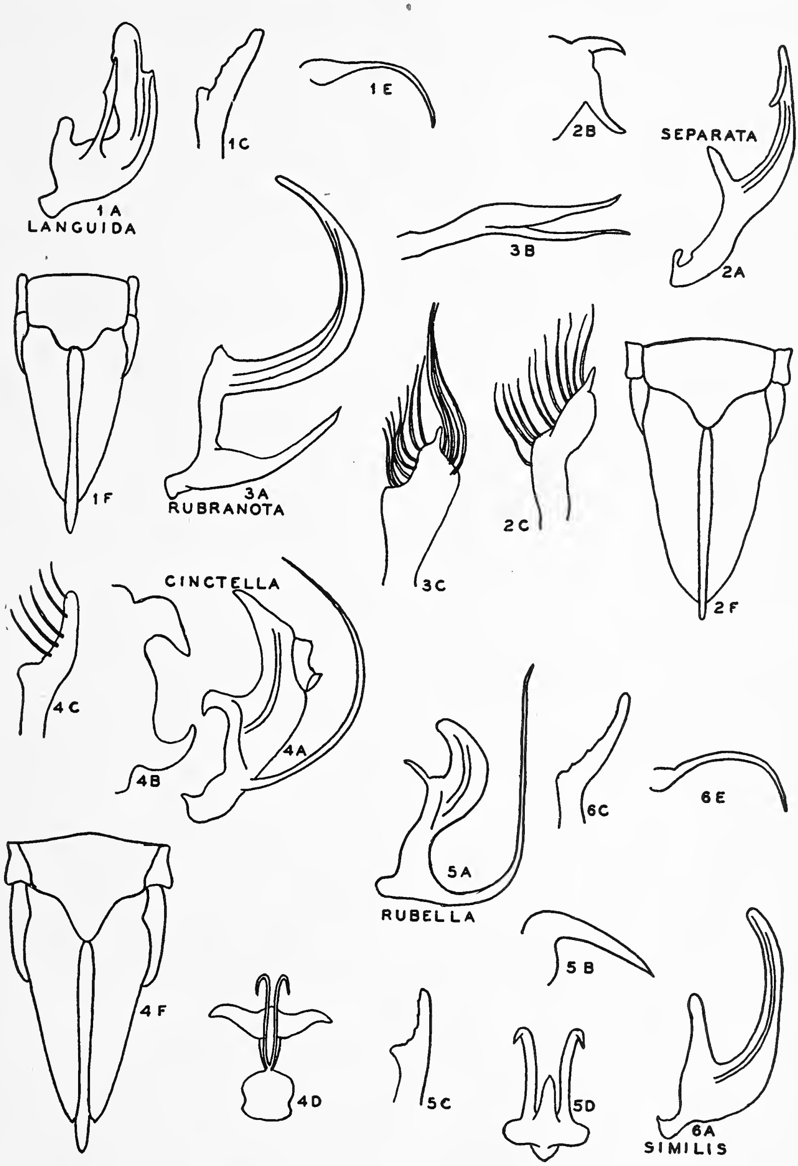
Explanation of Plate II

Genital structures of species of Alconeura as labeled. In each case the letter after the number denotes: A—the male aedeagus—lateral view, B—pygofer hook—lateral view, C—style—ventral view, D—aedeagus—ventral view, E—pygofer hook—dorsal view, F—female seventh sternite and pygofers.

Bull. B.E.S. Vol. XLVI Plate II



bluntly rounded apex. The style in ventral view with its distal portion narrow and sharply bent inwardly, the apex of the style bluntly rounded. The slender pygofer hooks arise on the dorso-caudal angle of the pygofer, taper to narrow, attenuate, sharply pointed apices, and curve outwardly in ventral view.

Holotype male collected at Valles, S.L.P., Oct. 24, 1941, by DeLong and Good; a damaged female collected by Dr. Dampf, El Mante, Tam., Sept. 26, 1930, (M.F. 1775), is referred to this species.

BOOK NOTES

The Chemistry and Action of Insecticides, by Harold H. Shepard. vii + 504 pp., 22 figures and 111 tables. $6 \times 9\frac{1}{2}$ ins., cloth bound. 1951. McGraw-Hill Book Company, New York, N. Y. (Price, $7.00.)

In the preface the author states that his objective is to present the more essential facts and theories relating to insecticides, including not only chemical, physical and toxicological aspects but also historical and commercial information. It would appear that this book accomplishes this large assignment in a most excellent fashion and, as a result, there now is available a reference text for all who are interested in the various phases of applied entomology or in the investigative lines taken by insecticide research.

In order that this note may give a clear idea as to the specific contents of this book, abbreviated titles of the chapters and the number (in parentheses) of pages devoted to each are as follows: Introduction (9) ; Arsenicals (32) ; Fluorines (12) ; Sulfurs (18) ; Coppers (20) ; Miscellaneous Inorganics and Metal-organics (23) ; Nicotines (29) ; Pyrethrins, Rotenone, etc. (47) ; Oils, Soaps, Creosotes (42) ; Synthetic Organics I (36) ; Synthetic Organics II (67) ; Chemical Control of Insects, General Aspects (77) ; Relative Toxicity and Mode of Action of Insecticides (45) ; Attractants and Repellents (17). There also is an appendix of 12 pages and an index of 17 pages. Each chapter is accompanied by a listing of references cited.—George S. Tulloch, Merrick, New York.

SOME NEW MYCETOPHILIDAE FROM THE WESTERN UNITED STATES.[1]

By F. R. SHAW, Amherst, Massachusetts.

In a collection of material sent to me by Dr. D. G. Denning of the University of Wyoming there are several new species. The present paper includes species of the subfamily Mycetophilinae.

It will be noted that the generic names proposed by Meigen (1800) are not followed. My reasons for ignoring these are (1) many of the genera as proposed are not recognizable, (2) subsequent designation of types by a worker unfamiliar with the group is not a sound basis for recognition of genera. In this paper reference is made to Johannsen's keys. These can be consulted in Johannsen's monograph of the Fungus Gnats of North America. This work, together with the unpublished thesis of Dr. Elizabeth Fisher, are essential references for anyone working on North American Mycetophilidae.

The following genera are represented in this paper—*Exechia, Mycetophila, Phronia* and *Rhymosia.* A total of seven new species and one new variety is recorded. Types are in my collection, paratypes are distributed as indicated in the text.

Exechia alexanderi n. sp.

Male: length 3 mm.

Head: general color brown, mouthparts yellow. First two and basal half of third antennal segment yellow, remainder brown.

Thorax: yellowish brown. Posterior pronotum yellow. Two scutellar bristles. Wing 2.5 mm. long, curvature of *Rs* not conspicuous, ratio of a : b = 0.78. Petiole of *M* about ½ the length of the *r–m* crossvein. Halteres yellow. Legs yellow. Hind femora with dorsal brown mark on proximal third. Meso- and metathoracic femora with brown markings below. Hind coxae with single basal setae. Basitarsi of fore legs subequal to tibiae.

Abdomen: brown. Apex of first segment lighter, intermediate abdominal segments lighter than others. Hypopygium (Fig. 1) yellow.

In Johannsen's key, this species would run to *E. bella* Joh. It can be distinguished by the shape of the dististyles and by the presence of a pair of leaflike structures arising from the ventral surface of the basistyles.

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[1] Contribution from Department of Entomology, University of Massachusetts.

Described from 2 males, one taken July 26–27, 1947 at a light trap, one August 29, 1947 in Laramie, Wyoming. Paratype in Denning's collection. I take pleasure in naming this insect for Dr. C. P. Alexander whose interest stimulated my investigations of this group.

Exechia ligulata n. sp.

Male: length 4 mm.

Head: dark brown. Palpi yellowish brown. First two antennal segments pale brown, third segment yellow with dark brown apex. Remainder of segments dark brown, compact.

Thorax: uniformly dark brown in color. Wing 3 mm. long, *Sc* short, ends free. Ratio of a : b = 0.78. Curvature of *Rs* not conspicuous. Petiole of *M* about ½ the length of the *r–m* crossvein. Brown spot in center of wing extending from M_{1+2} to Cu_2 and filling the base of the fork of *Cu*. Halteres with white tips. Legs: yellow. Fore basitarsi about ⅛ longer than tibiae. Metathoracic coxae with one basal bristle.

Abdomen: dark brown. Hypopygium (Fig. 2) yellow. Both dististyles elongate. A prominent median ventral lobe arises from between the basistyles. Between the dististyles on the ventral surface there is a small plate bearing four conspicuous setae.

In Johannsen's key, this species would run to *E. palmata* Joh. It can be distinguished from that species by differences in the shape of the dististyles and in other details of the hypopygium.

Described from one male collected by D. G. Denning at a light trap in Laramie, Wyoming on July 5, 1947.

Exechia pratti n. sp.

Male: length 4 mm.

Head: dark brown. Palpi yellow. First three and basal half of fourth antennal segments yellow. Remainder of segments dark brown.

Thorax: light brown. Prothorax yellow. Scutellar bristles two. Wing 3 mm. long. Curvature of *Rs* not conspicuous. Ratio of a : b = 0.8. Petiole of *M* about 1/3 the length of the *r–m* crossvein. Halteres yellow. Legs yellow, tibia and tarsi appear dark because of the presence of many fine setulae. Basitarsi of prothoracic legs subequal in length to the tibiae. Hind coxae with one basal seta.

Abdomen: dark brown. Anterior lateral portions of segments 1–3 somewhat paler. Hypopygium (Fig. 3) yellow.

In Johannsen's key this species would run to *E. bellula* Joh. from

which it can be distinguished by the structure of the hypopygium.

Described from one male taken by D. G. Denning on August 29, 1947 at Laramie, Wyoming. I take pleasure in naming this insect for Dr. H. D. Pratt whose interest in the Diptera has aided me in my studies.

Mycetophila denningi n. sp.

Male: length 4 mm.

Head: dark brown including the mouthparts. Palpi somewhat lighter. Second antennal segment yellow, others dark brown.

Thorax: dark brown. Two faint lines enclosing a wedge-shaped dark brown area, the two lines joining in front of the scutellum. Four scutellar bristles. Wing 3 mm. long, a dark patch covering the origin of *Rs, r–m* crossvein and the petiole of *M*. A second brown patch near the apex of the wing. Venation and pattern resemble that of *M. pectita* Joh. Halteres pale yellow. Legs: coxae yellow, prothoracic coxae somewhat darker than the others. All coxae with faint brown apical markings. Trochanters and femora yellow. Apices of femora brown. Tibiae and tarsi yellow with many tiny black spines. Mesothoracic tibiae with one spine on the flexor surface. Hind tibiae with two rows of spines on the extensor surface.

Abdomen: dark brown with the exception of a narrow light ring on apices of last four abdominal segments. Hypopygium (Fig. 4).

In Johannsen's key this species would run to *M. quatuornata* Loew. It can be distinguished by color markings of the head, thorax and abdomen from this species which was described from a female.

Described from one male collected by D. G. Denning at Grand Canyon, Arizona on June 18, 1949. I take pleasure in naming this species for D. G. Denning who collected most of the material on which this paper is based.

Phronia hitchcocki n. sp.

Male: length 4 mm.

Head: vertex and occiput dark brown. Frons and mouthparts yellow. First two and basal third of third antennal segment yellow, remainder dark brown, covered with whitish setulae.

Thorax: dark brown except for humeri and pronotum which are yellow. Scutellar bristles four. Wing 3.5 mm. long. Petiole of *M* about 2.5 times as long as the *r–m* crossvein. Halteres yellow. Legs—prothoracic and mesothoracic coxae yellow, metathoracic coxae brown. Trochanters yellow. Prothoracic and mesothoracic

femora yellow, metathoracic femora with brown apices. Tibiae yellow, slightly brownish at apices. Tarsi yellow but appearing dark due to the presence of fine setulae.

Abdomen: dark brown. Hypopygium (Fig. 5) dark brown except for the diststyles which are yellow.

In Johannsen's key this species would run to *Phronia insulsa* Joh. It can be distinguished by the structure of the hypopygium. In some respects, its affinities seem to be with *Phronia venusta* Joh.

Described from one male taken by D. G. Denning on Snowy Range Mountains, Albany County, Wyoming on Sept. 25, 1947. I take pleasure in naming this species for John D. Hitchcock of Laramie, Wyoming.

Rhymosia pediformis n. sp.

Male: length 4 mm.

Head: vertex and occiput dark brown. Mouthparts yellow. Antennae dark brown except for the basal three segments which are yellow. Third antennal segment about twice as long as broad, remainder of segments compact.

Thorax: dark brown except for propleura which are yellow. Wing 2.5 mm. long. *Sc* very short, the *r–m* crossvein longer than the petiole of *M*. *Cu* fork is proximad of the origin of the *r–m* crossvein. 1st anal about 5/12 the length of Cu_2. Scutellar bristles two. Halteres yellow. Legs—coxae, trochanters, femora and tibiae yellow except for black splash on under surface of metathoracic trochanters. Tarsi somewhat darker. Fore basitarsi subequal in length to tibiae.

Abdomen: first three segments brown dorsally, yellow below. Remainder of abdomen, including hypopygium, dark brown. Hypopygium (Fig. 6) having foot shaped tip of longer dististyle.

In Johannsen's key this species would run to his species "b" described from a female from Selkirk Mountains, British Columbia.

Described from one specimen collected by J. Simon July 15–19, 1949 at Jackson, Wyoming.

Rhymosia beckeri n. sp.

Male: length 4.5 mm.

Head: vertex, occiput and mouthparts dark brown. Palpi somewhat lighter. First two and basal half of third antennal segment yellow, remainder dark brown.

Thorax: dark brown. Wing 3 mm. long. The *r–m* crossvein longer than the petiole of *M*. Fork of *Cu* distad of the proximal

FIG. 1

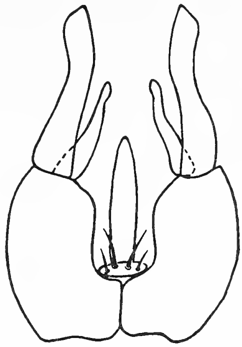

FIG. 2

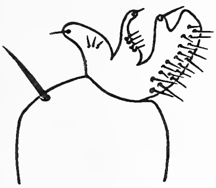

FIG. 3

FIG. 4

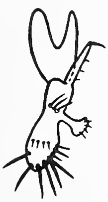

FIG. 5

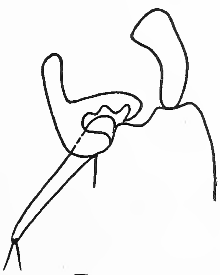

FIG. 7

FIG. 6

Explanation of Plate III

All figures are of male terminalia. Fig. 1. *Exechia alexanderi*—ventral view of distal half of basistyle and dististyle. Fig. 2. *Exechia ligulata*—ventral view of hypopygium. Fig. 3. *Exechia pratti*—lateral view of right basistyle and dististyle. Fig. 4. *Mycetophila denningi*—lateral view of left basistyle and dististyles. Fig. 5. *Phromia hitchcocki*—lateral view of right dististyles. Fig. 6. *Rhymosia pediformis*—lateral view of left basistyle and dististyles. Fig. 7. *Rhymosia beckeri*—lateral view of right dististyles.

end of the *r–m* crossvein, but before the fork of *M*, 1st anal extends about 2/3 the length of Cu_2. Scutellar bristles two. Halteres yellow. Legs—coxae yellow, trochanters yellow with dark brown spot below. Femora yellow with dark brown stripe below. Tibiae and tarsi appear dark because of the presence of many fine black setulae. Fore basitarsi about 1/10 longer than tibiae.

Abdomen: segments 1–4 dark brown above, paler on sides. Segments 2–4 have narrow posterior pale margins. Hypopygium (Fig. 7) pale yellow.

In Johannsen's key this species would run to his species "a" described from a female from California. It differs in having the fork of *Cu* distad of the base of the *r–m* crossvein.

Described from one male collected by D. G. Denning July 4–5, 1947 at Laramie, Wyoming. I take pleasure in naming this insect for my friend, Dr. W. B. Becker, of the Department of Entomology of the University of Massachusetts.

Rhymosia beckeri **marionae** n. var.

Included in the material collected by Dr. Denning were three males which differ somewhat from the typical *beckeri*. This new variety which I name *marionae* differs from the typical form in having the fork of *Cu* more nearly under the proximal end of the *r–m* crossvein and in the details of the ventral dististyle. Otherwise it is very similar to *R. beckeri*.

Described from 3 males collected from July–August, 1947 at Laramie, Wyoming by D. G. Denning. Paratypes at the University of Wyoming.

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Fisher, E. G. 1937. A Comparative Study of the Male Terminalia of the Mycetophilidae of Nearctic North America. 432 pp., 37 pls. Unpublished thesis, Cornell University.

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Meigen, J. W. 1800. Nouvelle classification des mouches a deux ailes. J. J. Fuchs. Paris, 40 pp.

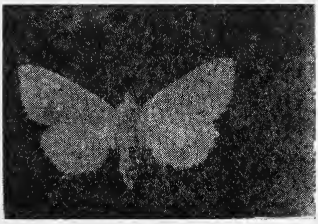
NEW HELIOTHID MOTH FROM NORTHERN CALIFORNIA.

By Rowland R. McElvare, Port Washington, Long Island, N. Y.

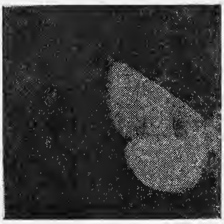
Schinia baueri n. sp.

Palpi porrect, white with scattered pink scaling. Head: frons straw color; in some specimens pink scaling on basal stalk of antennae and intermingled with white on epicranium. Thorax varying from white to pinkish brown. Abdomen whitish. Legs, white with scattered pink scales; tibiae, hairy, spinose; foretibiae with very long heavy terminal claw on inside and one or two claws above, and heavy outer terminal claw with one or two claws above.

Primaries: specimens vary in general appearance from medium pink to a dark pinkish brown; ground color white overlaid with pink and brown scales, somewhat darker in basal and subterminal areas. Lines whitish. T.a. line outwardly curved for 1/3 its length, then angled inward to margin. T.p. line slightly bisinuate. S.t. line well defined, slightly dentate, straight or with a slight outward curve. Fine dark broken terminal line present in some specimens. Reniform vague. Fringes basally pinkish brown and white, outer half whitish.



Schinia baueri.



S. sara.

Secondaries whitish with a diffused smoky marginal band, and in some specimens a pink broken marginal line. Fringes pink and white, becoming white toward anal angle.

Under side: Primaries white on costa, with pink scaling below widening toward apex and extending down outer margin, inside which is an indefinite smoky parallel band; median area smoky; reniform indicated; fringes pink and white. Secondaries white, pinkish on costa and outer margin; fringes white and pink, becoming entirely white toward anal angle.

Expanse 26–30 mm.

Holotype male, July 21, 1950, Anderson Springs, Lake Co., California, William R. Bauer, collector.

Allotype female, August 19, 1950, same locality and collector.

Paratypes, 18 males, 11 females, collected between July 23 and September 5, 1948–1950, same locality and collector.

Holotype male and allotype female placed in collection of United States National Museum, Washington, D. C. Paratype males in U. S. National Museum, American Museum of Natural History, New York, N. Y., California Academy of Sciences, San Francisco, Cal., and Los Angeles County Museum, Los Angeles, Cal. Five paratype males and five paratype females in collection of William R. Bauer, Petaluma, Cal., and remainder in collection of Rowland R. McElvare, Port Washington, L. I., N. Y.

Mr. Bauer reports occasional specimens were attracted to lights, usually resting quietly some distance away. Most of the moths were found resting on the flowers of *Brickellia californica* T. & G., at dusk for about an hour.

This new species is allied to *Schinia sara* Sm., from southern Arizona. The following prominent characteristics indicate differentiation. In the primaries of *S. baueri,* the color is pinkish brown with little contrast, the color of the subterminal area is fairly even, the s.t. line is well defined. On the foretibiae, the armature is well developed. In the primaries of *S. sara,* the color is a yellow brown with the basal area darkly contrasting, the color of the subterminal area is interrupted in the middle, and the s.t. line is mainly a difference in shade. On the foretibiae, above the terminal claws the armature is weak.

ADDITIONS TO VESPINE BIOLOGY VIII: THE APPRECIATON OF TIME AMONG WASPS.

By Albro T. Gaul, Brooklyn, New York.

While undertaking some studies on the mechanisms of Vespine flight, the possibility of a Vespine "time sense" was a natural consideration. The location of flights in time is just as important as the location of flights in direction and distance. The author has attempted to determine whether the Vespinae can form any flight habits based on time, as they can in establishing definite directional flight patterns for certain activities.

For two weeks in July, 1949 a small portable table was located in the field about 50 feet from a colony of *Vespula rufa* var. *vidua* Sauss. and about ten feet from a popular flightway for these wasps. (The author defines a flightway as a definite flight path, whose direction is consistently followed by a number of wasps, at a rate estimated to equal or exceed 100 flights per hour.) The table held a petri dish which was empty most of the day. At exactly 11:00 A.M. (E.D.S.T.) each day the petri dish was stocked with 10 cc. of dilute honey. This honey bait attracted the foraging workers. This feeding technique continued for 14 days, except when it was raining at 11:00 A.M. On the fifteenth day the honey was withheld. The author confidently expected the wasps to appear at the petri dish as usual. They did not appear. On the sixteenth day some odorless glucose solution was placed in the petri dish in substitution for the honey. Only two wasps had discovered the glucose after the first half hour.

It was tentatively concluded that temporal appreciation among wasps was either absent or highly imperfect.

As the author has shown (2), when night approaches not all the ergates are successful in returning to the nest. Not only do these workers have visual warning, in the decrease in light intensity, but should they have a temporal appreciation they would return to the nest before it became too dark to fly.

Beling (1), Wahl (5), and Kleber (3) have demonstrated the appreciation of time in the honeybee, while Verlaine (4) has claimed that wasps have a "time sense." It is believed that a sense of time is utilized by the honeybee in seeking pollen and nectar, since certain blossoms produce their maximum quantity or quality of product at definite times of day. The Vespinae, on the other hand have no need for such timing. Although they frequent flowers, their basic diet is animal tissue, whose availability is more sea-

sonal than temporal. It may thus be stated that a sense of time appreciation would serve no very useful function among the Vespine wasps.

Since no wasps in a complete colony learned to recognize a regular time of feeding, and since many wasps in a colony do not learn when it is time to conclude the day's activities, it has been concluded that the Vespine wasps have little or no time appreciation, or if such appreciation exists, it serves no major function in regulating behavior.

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3. **Kleber, E.** 1935. Time sense of the honeybee. Z. Vergl. Physiol. Vol. 22, pp. 221.
4. **Verlaine, L.** 1929. Time sense in Wasps. Bull. Ann. Ent. Soc. Belg. Vol. 69, pp. 115.
5. **Wahl, O.** 1933. Appreciation of Time in Apis. Z. Vergl. Physiol. Vol. 18, pp. 709.

Bugs Damage Grass in Utah: A grayish black bug, *Thyrillus pacificus* (Uhler), on June 30, 1950, was found to be seriously attacking and damaging leaves of giant rye-grass, timothy, blue grass, brome, and several other grasses. Its feeding injury extended to from a few feet to approximately four rods, into a field of spring wheat, which adjoined the grass pasture land. This wheat was not yet headed out. Feeding injury has caused serious blotch-patterns, which resulted in yellowing and dying of apical growth of much of the heavily infested giant rye grass, and to a less conspicuous extent to other kinds of the more seriously injured grasses. Approximately 1.5 acres of giant rye grass was seriously yellowed; also an equal area of adjoining land covered by shorter grasses, was conspicuously damaged. Moderate damage had occurred to wheat on the field margin adjoining grass. The damage was most severe on the marginal 3 to 4 feet of the small grain crop. Such damage extended irregularly into the field. Occasional wheat plants were severely damaged farther into the field. Bugs tended to be gregarious, severely damaging some plants while causing only light injury to others nearby, in the less heavily

infested areas. This bug infestation occurred on a foothill ranch, between Peterson and Mountain Green, in Morgan County, Utah. Other Hemiptera present on the infested grasses included smaller numbers of *Labops hirtus* Knight and *Strongylocoris atritibialis* Knight.—George F. Knowlton, Logan, Utah.

Harvester Ants on the Western Range: The western harvester ant, *Pogonomyrmex occidentalis* (Cresson), is an extremely costly insect pest, so far as range grazing forage is concerned in Utah and in many other parts of the west. For years I have observed the nest mounds and clearings made by this species, trying to make a fair estimate of the surface area loss involved.

While nests per acre varies markedly, there are hundreds of thousands of acres in Utah and in adjoining states where 2 to approximately 15 percent of the range area is completely devoid of vegetation which has been cleared for nests, including the large clearing which surrounds each harvester ant nest. This magnitude of the area of loss was particularly driven home to me during a flight of approximately 2,100 miles which was made from Provo, Utah to Logandale, Nevada; thence to Indio, California; on the Phoenix, Arizona; and return to Provo. Much of this flight was made over harvester ant infested range areas. The ant nests and clearings conspicuously "pock marked" the range. This harvester ant reduces the carrying capacity of western ranges by thousands of cattle and sheep units, every year. Whether ant control will someday become profitable, under range conditions, is a problem of the future. Meanwhile, ants, grasshoppers, Morman crickets, false chinchbugs, army cutworms, and many other pests, take their heavy toll of range forage, competing directly with livestock for the range feed.

Were it not for lizards and birds, certain insectivorous mammals and various parasitic and predacious insects, range insect pests would even more seriously compete with livestock and wildlife for the vegetation of our western range lands.—George F. Knowlton, Logan, Utah.

ELECTRON MICROGRAPHS OF ANTENNAL HAIRS OF MOSQUITOES

By G. S. Tulloch and J. E. Shapiro, Brooklyn, New York

The antenna of a mosquito consists of a small inconspicuous basal segment, a globular second segment and a many-segmented flagellum. Hairs arranged in whorls arise at the junctions of the flagellar segments and in the males these are longer and more numerous than in the females. Light microscope studies yield little information concerning the structure of these hairs which may be involved in sound perception. Since their basic structure may be helpful in interpreting their function, the present note reports observations on two species of mosquitoes made with the aid of the 50 kilovolt electron beam.

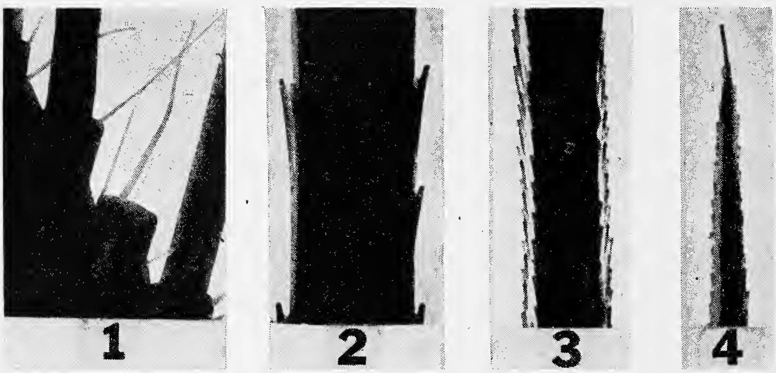

Fig. 1. Flagellar junction of *Culex quinquefasciatus* male showing origin of antennal hairs (2800 ×). Fig. 2. Portion of shaft of hair of *Chaoborus brasiliensis* male (7500 ×). Fig. 3. Portion of shaft of hair of *C. quinquefasciatus* male (7500 ×). Fig. 4. Tip of antennal hair of *C. quinquefasciatus* male (7500 ×).

For orientative purposes a brief description of the gross features of the flagellar hairs of *Culex quinquefasciatus* Say is included here. In the males of this species approximately 30–35 hairs arise at each flagellar junction. These are slender, tapering structures which gradually decrease in length toward the free end of the flagellum, the longest being 0.7–0.8 mm. and the shortest 0.4–0.5 mm. In the females only 6–8 hairs arise in each junction and these are somewhat uniformly about 0.3 mm. in length. In both sexes the diameter of each hair at the widest or basal portion is

about 2 micra. A similar distribution of structures is found in *Chaoborus brasiliensis* Theobald although in both sexes the hairs are somewhat shorter and thicker.

Electron Microscope Observations

The thickness of the hairs blocks the passage of the electron beam except at the thinner margins and consequently a partial silhouette effect is obtained in the micrographs.

In *Culex quinquefasciatus* the hairs arise from collar-like sockets arranged in a regular fashion at each flagellar junction (Fig. 1). The height of each socket is about 4 micra and the diameter approximately 3 micra. The diameter of the hair arising therefrom is about 2 micra indicating some freedom of movement at the point of insertion. The shaft of each hair resembles a hollow attenuated cone whose surface, though smooth in appearance in the basal region (Fig. 1), is characterized distally by longitudinal lines or rows of projections resembling the teeth of a rip saw (Figs. 3 & 4). In the tip region a definite telescoping arrangement may be noted (Fig. 4) with each unit receiving a base of the smaller unit next above. The terminal and also the narrowest unit has a diameter of approximately 40 millimicra throughout its entire length, is blunt tipped, and fits into the second unit which has a diameter of about 90 millimicra. Farther down the shaft the telescoping effect is less obvious (Figs. 3 & 4) although it is possible that the saw-tooth projections of the various rows may be interconnected in a festooned manner. Four longitudinal rows of projections may be noted in Figure 3 and it is estimated that at least sixteen such rows are present in the circumference of the shaft. At a point midway between the base and tip the distance between the points of the teeth in any one row varies between 0.25 and 0.5 micra and their outward projection is approximately 50 millimicra (Fig. 3).

In *Chaoborus brasiliensis* the hairs are shorter and thicker than in *C. quinquefasciatus* but exhibit the same fundamental structure. They differ, however, in the detail of the projections along the shaft of the hair. Specifically these projections are more acutely angled and are interconnected, at least in the marginal areas, by thin membranes. Moreover the interval between the points is greater and the number of longitudinal rows is estimated to be more than thirty. A comparison of Figures 2 and 3 which are of the hairs or *Chaoborus* and *Culex* taken at approximately the same level will show the difference mentioned above.

These observations indicate that the flagellar hairs of mosquitoes

are delicate structures which arise from collar-like sockets at the flagellar junctions. Each hair is approximately 30 times narrower at the tip than at the base and the apical units show a definite telescoping effect. For the most part each hair is beset with rows of tooth-like projections which in the males of *Culex quinquefasciatus* are estimated to be in excess of 40,000. Although widely separated species may show the same fundamental structure, specific differences exist particularly with reference to the spacing and nature of the toothed projections.

Mitoura gryneus octoscripta n. var. Typical *gryneus* except: in Scudder's Butterflies of Eastern United States and Canada he wrote under varieties of *M. damon* (Vol. 2, page 863) as follows: "In one specimen the portion of the extra-mesial band of the secondaries, which crosses the medio-submedian interspace, separates itself entirely from the rest of the band, and forms an independent, longitudinal, slightly curved streak almost connecting the lower basal streak with the extra-mesial band."

This above mentioned curved streak closes the open gap of the design along the inner margin and makes the whole outline similar to the arabian figure eight—hence the name.

Seven males and one female, all from Passaic Co., New Jersey, April 28 to May 14. The holotype will go to the American Museum of Natural History, one paratype each to H. A. Freeman and Jos. Mueller. The allotype and four paratypes will remain with me for the time being.—Otto Buchholz, Roselle Park, New Jersey.

THE LIFE HISTORY OF STRYMON CECROPS FABRICIUS (LEPIDOPTERA, LYCAENIDAE).

By George W. Rawson, Murray Hill, N. J. and
Sidney A. Hessel, Woodmere, N. Y.

While *Strymon cecrops* has been known since 1793 almost nothing has been published of its early stages and life history (1). Based on the deduction that *S. crecrops* is the "least" of the three "purple hair-streak" butterflies in Abbot's notes Scudder (1) cites that he raised it from a larva found on a species of *Vaccinium*. There is no entry for the species in Henry Edwards' Bibliographical Catalogue of the Described Transformations of North American Lepidoptera (2) or in the supplements thereto by Davenport and Dethier (3) and Dethier (4).

In his Butterflies of New Jersey (5) W. P. Comstock includes the species in the "Supplemental List" as an occasional visitor, citing a single incomplete record. In September, 1947, however, we captured two specimens on willow-herb (probably *Epilobium hirsutum* L.) growing at the margin of a rose-mallow swamp near Reed's Beach, Cape May County, N. J. and the following year some thirty-five to forty were observed (6). On August 26, 1950 the locality was again visited. *S. cecrops* was in abundance, about fifty specimens being taken in a single afternoon, notwithstanding considerable wariness on the part of the insects to approach within netting distance.

Careful observations were made with a view to the determination of the food plant. The overwhelming frequency of association of both sexes of *S. crecrops* with the mountain or dwarf sumac (*Rhus copallina* L.) in contrast to the other flora suggested it as the most likely. While the butterflies at times were on the flowers of the plant more often they were hidden among the foliage until startled by our close approach or by light tapping of the bush. Captured females were placed in paper bags together with cuttings from the sumac for transportation home.

One female had already laid eggs on the plant material at the time of transfer to a breeding chamber. The technique employed to induce oviposition in captivity was that of F. Richard as translated by C. L. Remington (7). The confined females lived from 12 to 23 days and laid an average of 20 to 30 eggs. We do not know, however, how long since they had emerged from pupae and how many ova had been laid before capture. Actual oviposition was not observed but they were laid singly, chiefly underneath the

tips of the younger leaflets of the sumac, some on the unopened buds of the flowers. Other plants conspicuous in the natural habitat of the butterfly were ignored by the gravid females and subsequently also by the newly-hatched larvae. Those tested were swamp rose-mallow (*Hibiscus Moscheùtos* L.), bayberry (*Myrica pensylvanica* Loisel.) and sassafras (*Sassafras variifolium* Salisb.).

Some newly-hatched larvae fed for a time on unopened flower buds but the majority chose the leaves. Until the third instar they consumed only the under surface. Thereafter, in some cases, holes were formed and enlarged but in others the larvae continued to feed to maturity as before. A negative phototrophic tendency was evidenced by their efforts to retreat from strong light as well as their preference to consume the upper surfaces of leaflets turned over, or covered by another. The larvae were normally very sedentary except prior to ecdysis and in their search for a suitable location for pupation. When disturbed during the first three instars they would curl into a ball, losing their grip on the food plant, and remain motionless in that position for fifteen seconds or longer. If they produced any silken threads such did not function to suspend them. Thin strands of silk were seen adhering to the container during the prepupal stage. We were surprised to observe that of three larvae reared individually in Petri dishes all cast skins of one were recovered and of the other two only the skin from the first instar which might very easily have been overlooked was not found. No attempt had been made to remove the castings before they could be consumed. It seems evident, at least under artificial conditions, that the larvae have no interest in eating them. The newly-hatched caterpillars had consumed hardly more than the upper quarter of the egg-shell. The duration of the larval stage was approximately 38–42 days.

Pupation took place against the surfaces of the leaflets of the food plant or container by loose attachment consisting of about twenty very fine silken threads on each side running from the area just dorsad of the edge of the wing cases. Most of the threads fan out slightly from the point attached to the pupa but marked uniformity in this respect is lacking and the general impression is of a rather haphazard or irregular construction. There is only the slightest trace of a silken bed beneath and no defined girdle on the thorax. There is, however, a reasonably well secured silk pad into which the cremaster is embedded.

As most of the larvae pupated between the 6th and 18th of October it was not anticipated that they would emerge until the fol-

lowing spring. After 16 to 17 days at room temperature, however, they began to appear until the pupae were placed under refrigeration. A single specimen removed from refrigeration in December came out a week later. Another individual kept outdoors in an unheated garage emerged in November. The relatively rapid development from egg to pupa and from pupa to imago especially, leads us to the belief that the generation of which our material was a part would surely emerge before mid-August even under natural conditions. In all probability the species will prove to be double brooded in New Jersey as it is in its normal known range considerably to the south. Perhaps there are several broods or overlapping broods in some parts. Comstock's single citation in New Jersey (5) is June 29th. This date would be embraced in the indicated spring or early summer brood. We have not had the opportunity of visiting the relatively recently discovered Reed's Beach *S. cecrops* colony when this earlier brood would be expected to be on the wing. It seems most certain that the butterfly passes the winter as a pupa in this northern portion of its range. Together with our previous experiences (6) the results of the 1950 visit indicates that the butterfly is a resident of the southern part of New Jersey and that dwarf sumac is the food plant in this locality.

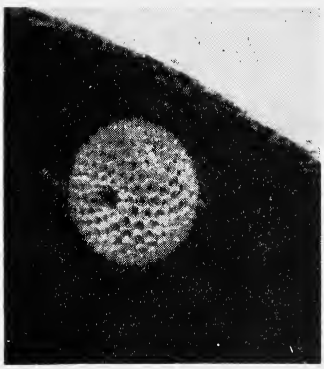

FIG. 1. Egg of *Strymon cecrops* Fabr. (45 ×).

DESCRIPTIONS OF IMMATURE STAGES

Egg.

Pearly white changing to pale brown before hatching. Echinoid, height less than 2/3 of width, flattened ventrally. Micropyle relatively small, depressed. Cells over the surface mostly uniform in size, hexagonal. Each side of the hexagon is connected to the

depressed floor of the cell by two surfaces inclined inwardly forming a smaller duodecagon of slightly concave sides at the base. The cell floor is punctuated with a dozen or more pores. Spiculiferous processes arise from the angles of the hexagon. The regularity of features produces a remarkable geometric pattern. Diameter approximately 0.33 mm. (Fig. 1). The larvae emerge in 7–8 days.

Larva.

First instar: Newly-hatched larva pale yellow clothed with long brownish hairs which arch backwards. These are arranged in longitudinal rows. Head light brown, ocelli black. After feeding the larva becomes slightly greenish dorsally and rosy laterally. Length at emergence approximately 2 mm., height approximately 0.5 mm. Duration of instar 6–7 days.

Second instar: Hairs much reduced in length, tapering. Dorsal and lateral surfaces pale olive green. Ventral surface pale yellow, devoid of hairs. Double red-brown dorsal line, greenish between on segments 5–12. Late in this stage spiracles become dark red-brown and a reddish spiracular line is evident on segments 3–9. A prominent black diamond-shaped cervical shield bearing six short setae and eight white tubercles. Head light brown; ocelli black. Duration of instar 5–7 days.

Third instar: Similar to previous, color darker, making for less contrast of dorsal stripes. Spiracles black. Spiracular stripe all but indiscernible. Length 4–5 mm. Duration of instar 7–10 days.

Fourth instar: Much as before, color again slightly darker. Dorsal stripes very faint. More setae, still arranged in groups so that apex of dorsum naked. Length 7–8 mm. Duration of instar 7–9 days.

Fifth instar: Heavy pilous coat, dark brown with hoary tinge caused by generous interspersion of new type of finer and longer hairs wavy at tips. Bluish-green dorsal stripe on all except first thoracic and anal segments. Setae now cover entire dorsum. Head black, spiracles black. Cervical shield even more conspicuous, bisected longitudinally more or less prominently by a faint

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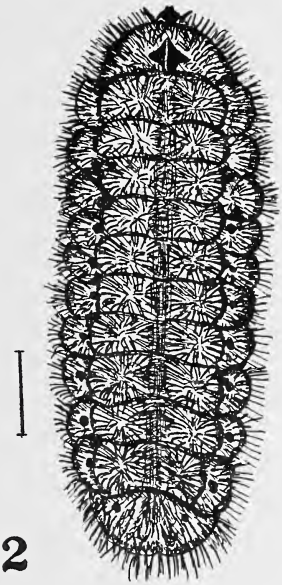
Explanation of Plate IV

All figures are of *Strymon cecrops* Fabr. Fig. 2. Dorsal view of mature larva. Figs. 3, 4 & 5. Lateral, dorsal and ventral views of pupa.



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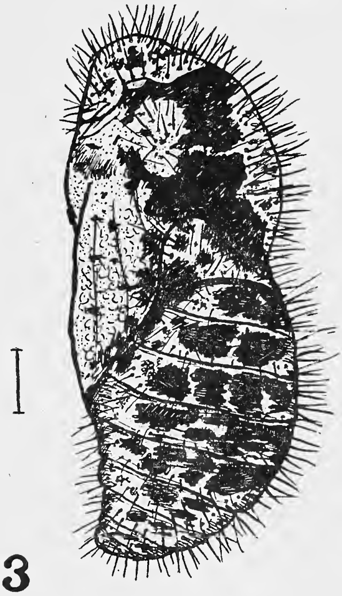

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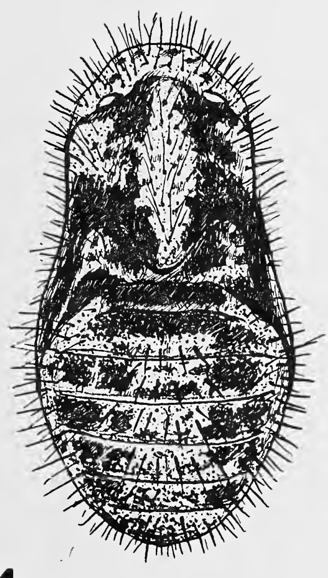

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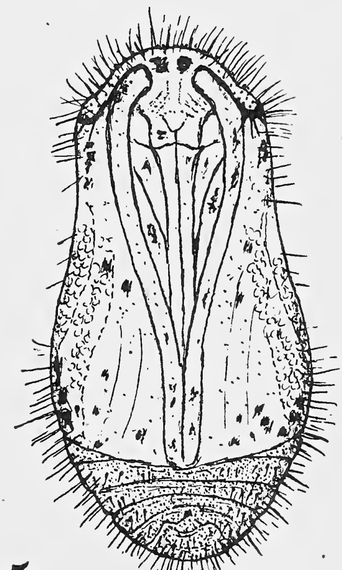

5

line or suture. First thoracic segment now developed into prominent hood. Length 11–13 mm. (Fig. 2). Duration of instar to pupation 10–13 days.

Pupa.

Pale chestnut-brown, becoming darker with age until preparatory to emergence. Dorsal and lateral surfaces mottled with black spots and blotches producing (when fresh) a "contrasty" appearnace. Thorax well arched. Covered with short sparse black-brown setae except wing covering and venter. Length approximately 9 mm., breadth 4.5 mm. (Figs. 3, 4, 5).

In conclusion we wish to express our appreciation for suggestions and advice given to us by our genial field companion and co-worker Dr. J. Benjamin Ziegler of Summit, N. J., and our thanks to Mr. Robert Wolf, staff photographer Ciba Pharmaceutical Products Inc., Summit, N. J., for his cooperation in photographing the egg of *S. cecrops*.

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CONTENTS

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BULLETIN

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Vol. XLVI OCTOBER, 1951 No. 4

NEW OR INSUFFICIENTLY-KNOWN CRANE-FLIES FROM THE NEARCTIC REGION (DIPTERA, TIPULIDAE) PART XIV.[1]

By C. P. Alexander, Amherst, Mass.

The preceding part under this general title was published in December, 1950 (Bull. Brooklyn Ent. Soc., 45: 156–160). At this time I am characterizing a few further species of the genus *Tipula,* all from California and chiefly from the Hastings Reservation, in the Santa Lucia Mountains, Monterey County, where they were taken by the Director of the Reservation, Dr. Jean M. Linsdale. I wish to express my deepest thanks and appreciation to Dr. Linsdale for the privilege of studying exceedingly large series of crane-flies from the Reservation which have provided an exceptionally complete list of the species. Representatives of the species are contained in the collections of the Frances Simes Hastings Natural History Museum and in my personal collection. Further acknowledgments are made later in the paper under the discussion of *Tipula* (*Lunatipula*) *hastingsae.*

Tipula (Hesperotipula) linsdalei n. sp.

Male: Length about 12–13 mm.; wing 14–15 mm.; antenna about 3.5 mm.

Female: Length about 13 mm.; wing 13.5–14 mm.

Frontal prolongation of head brown; nasus relatively short; palpi black. Antennae (male) with basal three segments yellow, remaining ones black. Head black, gray pruinose.

Pronotum dark brown medially above, paling to yellow on the sides. Mesonotum yellow, the praescutum with more reddish stripes; pleura yellow. Halteres with stem brownish yellow, knob

[1] Contribution from the Department of Entomology, University of Massachusetts.

darker brown, the base of stem clearer yellow. Legs with the coxae and trochanters yellow; femora yellow, the tips blackened; tibiae obscure yellow, the tips more narrowly darkened; tarsi passing into brownish black; claws (male) toothed. Wings whitish subhyaline, the centers of cells beyond cord, as well as cell *R,* slightly more darkened, the veins thus appearing to be seamed with the pale ground; stigma and a small spot at origin of *Rs* darker brown; prearcular and costal fields yellowed; veins brown, more brownish yellow in the brightened portions. Venation: *Rs* fully three times the short *m–cu.*

Abdominal tergites reddish yellow, with three broken black stripes, the median one interrupted by the gray posterior borders of the segments, the lateral stripes reduced to major spots on the basal parts of the individual segments; sternites clearer yellow; hypopygium castaneous. Male hypopygium with the ninth tergite distinctive, appearing as a flattened plate on either side of a narrow median notch, the margins rolled downward to form a partial cylinder. Horn of the basistyle short and unusually widened at base, scarcely longer than the inner dististyle. Inner dististyle with the beak short and blunt, not blackened; outer basal lobe large, virtually on a level with the main body of the style from which it is separated by a small notch; basal lobes of style of moderate size only. Eighth sternite with the setae of both the lateral and median lobes very long and numerous.

Habitat: California (Monterey County).

Holotype: ♂, Hastings Reservation, June 1, 1943 (J. M. Linsdale); returned to Dr. Linsdale. *Allotopotype;* ♀, pinned with type. *Paratopotypes:* 7 ♂♀, May 6–June 1, 1943 (Linsdale).

I am very pleased to name this fly for the collector, Dr. Jean M. Linsdale, Director of the Frances Simes Hastings Natural History Reservation. The most similar described species is *Tipula* (*Hesperotipula*) *micheneri* Alexander, which differs chiefly in the details of structure of the male hypopygium.

Tipula (Hesperotipula) ovalis n. sp.

Male: Length about 14 mm.; wing 14.5 mm.; antenna about 4.6 mm.

Female: Length about 13 mm.; wing 16 mm.

Frontal prolongation of head obscure yellow; nasus elongate; palpi with basal three segments dark brown, the terminal one fading to pale brown. Antennae (male) of moderate length, as indicated by the measurements; basal three segments yellow, re-

mainder of flagellum black; flagellar segments only gently incised; longest verticils subequal to the segments. Head black, gray pruinose.

Thoracic dorsum reddish yellow, without distinct pattern, the pleura somewhat clearer yellow. Halteres dark brown, the base of stem narrowly yellow. Legs with the coxae and trochanters yellow; femora obscure yellow, the tips brownish black; tibiae and tarsi brown; claws (male) toothed. Wings with a brownish ground, more or less distinctly streaked with paler, especially evident along the veins beyond the cord; prearcular and costal fields yellow; stigma medium brown; veins brown; sparse macrotrichia in cell R_5.

Abdomen (male) with the tergites yellow, with a broken median brown stripe and conspicuous brownish black sublateral spots on segments two to five; sternites and hypopygium more uniformly pale. In female, the lateral tergal borders are distinctly infuscated, the median stripe best indicated on the more proximal segments. Male hypopygium with the upper plate of the ninth tergite produced into two oval blackened lobes, with smooth margins, separated by a narrow notch; lower plate terminating in two low transverse blackened ledges, separated at the midline by a very small notch. Basistyle produced into a long, unusually slender horn that narrows gradually to the acute tip. Outer dististyle dark-colored, gently sinuous in outline, provided with coarse black setae. Inner dististyle with the beak slender, blackened; dorsal crest low, the outermost lobe large and flattened, provided with abundant erect yellow setae, the smaller outer lobe behind the dorsal crest small and separated from the crest only by a small notch. Eighth sternite with the setae of the lateral lobes long and delicate, very abundant; median lobe with only about a dozen much stouter bristles.

Habitat: California (Monterey County).

Holotype: ♂, Hastings Reservation, along Finch Creek, May 21, 1943 (J. M. Linsdale); Alexander Collection. *Allotopotype:* ♀, with the type; returned to Dr. Linsdale.

The most similar described species are *Tipula* (*Hesperotipula*) *circularis* Alexander and *T.* (*H.*) *streptocera* Doane, which differ in the details of structure of the male hypopygium, particularly of the ninth tergite, basistyle, inner dististyle and eighth sternite.

Tipula (Lunatipula) hastingsae n. sp.

Male: Length about 15–16 mm.; wing 16–19 mm.; antenna about 4.5–5 mm.

Female: Length about 18–22 mm.; wing 16–21 mm.

Characters mostly as in *polycantha* Alexander (Southern Rocky Mountain Region), differing in details of wing pattern and structure of the male hypopygium.

Head light gray. Antennae with the scape and pedicel brown, flagellum brownish black to black; basal swellings of the segments moderately developed.

Mesonotal praescutum with all dark stripes confluent, the posterior end of the median stripe much paler. Wings with the dark and pale pattern very contrasted, the former being slightly more extensive than the latter; costal border uniformly darkened; white areas before cord very irregular, not forming a narrow transverse band at near one-third the wing length, as in *polycantha;* pale pattern in cells *M* and *1st A* particularly extensive; beyond the cord, the pattern distribution more as in *polycantha* but much more contrasted.

Male hypopygium more as in *polycantha* than in *vittatipennis,* especially in the armature of the eighth sternite. Ninth tergite with the tergal lobes broader and more rounded. Outer dististyle expanded at outer end, the outer angle obtuse, not produced as in *polycantha.* Inner dististyle narrower and more produced, the outer basal lobe larger. Ninth sternite with the horns slender and relatively inconspicuous, the tips pointed. Gonapophyses appearing as very powerful divergent curved arms. Eighth sternite with about five or six major modified setae on either side, with a few more reduced ones at the base of the series. *Tipula polycantha* differs especially in the details of the ninth tergite, both dististyles, gonapophyses and the eighth sternite.

Habitat: California.

Holotype: ♂, Mount Diablo, Contra Costa County, altitude 2860 feet, May 12, 1940 (Mont A. Cazier). *Allotopotype:* ♀, pinned with the type. *Paratypes:* ♂, San Gabriel River Bird Sanctuary, May 21, 1945 (J. A. Comstock); numerous ♂♀, Del Mar, San Diego County, April 29–May 13, 1945, June 10, 1945, late June 1950 (J. A. Comstock); ♂♀, San Jacinto River Canyon, above Hemet, Riverside County, in chaparral, May 14, 1939 (T. H. G. Aitken); ♂♀, Hastings Reservation, Monterey County, June 13, 1938, April 26, May 9, May 23, 1943 (J. M. Linsdale); 1 ♀, Shingle Springs, El Dorado County, May 27, 1939 (Mont A. Cazier).

This very attractive species is named for Mrs. Frances Simes Hastings, through whose thoughtfulness and generosity the Has-

tings Natural History Reservation has been established and maintained. As indicated in the above diagnosis, the closest relative is *Tipula* (*Lunatipula*) *polycantha* Alexander, which has been compared throughout the description.

Tipula (Lunatipula) sanctæ-luciæ n. sp.

Size medium (wing, male, about 15 mm.); mesonotal praescutum yellow, with three black stripes, the whole surface obscured by a sparse gray pruinosity; legs yellow, the tips of the femora and tibiae narrowly brownish black; wings with the ground creamy white, the centers of virtually all cells slightly infuscated, leaving broad borders of the ground along the veins; stigma brown; abdominal tergites with a conspicuous black median stripe, the usual lateral stripes represented by isolated dark spots on the sublateral portions of tergites two to seven; male hypopygium with the tergite deeply notched medially, each lobe again with a very deep and narrow U-shaped emargination, the inner lobule thus formed lying almost on edge, the flattened face against the midline; outer dististyle appearing as a glabrous polished scoop, the entire inner or concave face with an abundance of long yellow setae; eighth sternite sheathing, strongly narrowed outwardly, bearing two apical lobes, each with a dense brush of relatively short yellow setae.

Male: Length about 14 mm.; wing 15.5 mm.; antenna about 4 mm.

Frontal prolongation of head castaneous, slightly darker on dorsum; nasus long and slender; palpi black, the long terminal segment much paler. Antennae with the basal three segments light yellow, the remaining segments brownish black, the basal enlargements of the more proximal ones still darker; verticils subequal in length to the segments. Anterior vertex reddish, posterior vertex and occiput black, both partly concealed by a gray pruinosity, particularly in front; no vertical tubercle.

Pronotal scutum protuberant and blackened medially, the sides brownish yellow; scutellum and pretergites obscure yellow. Mesonotal praescutum with the restricted ground color yellow, the disk chiefly covered by three black stripes, the whole surface rendered opaque by a sparse gray pruinosity; lateral and humeral portions of the ground more or less patterned with reddish; scutum obscure yellow, each lobe with a single major blackened sparsely pruinose area; scutellum and mediotergite reddish yellow, both with sparse scattered erect setae; pleurotergite more or less darkened, light brown. Pleura chiefly obscure yellow. Halteres with stem ob-

scure yellow, knob infuscated. Legs with the coxae and trochanters yellow; femora and tibiae yellow, the tips narrowly brownish black, the amount subequal on all legs; basitarsi obscure yellow, the apex and remainder of tarsi black; claws (male) toothed. Wings relatively broad; ground color creamy white, the centers of virtually all the cells slightly infuscated, leaving broad borders of the ground along the veins; cell *C* pale brown, prearcular field and cell *Sc* clear yellow; stigma brown, relatively conspicuous, with several trichia; a small brown spot at origin of *Rs;* vein brown, paler in the brightened fields. Venation: *Rs* about three times the short *m-cu;* petiole of cell M_1 about one-half longer than *m.*

Abdomen yellow, more or less polished; tergites with a conspicuous black median stripe, on the subterminal segments interrupted by pale yellow borders; the usual lateral stripes replaced by isolated brownish black spots on sublateral portions of tergites two to seven, inclusive; sternites chiefly obscure yellow, the posterior borders of the segments vaguely more infuscated; hypopygium relatively large, castaneous. Male hypopygium with the tergite small, set off from the sternite by impressed sutures; basistyle entire, large and conspicuous. Ninth tergite of peculiar conformation, strongly elevated and corrugated, almost divided by a deep and narrow notch and groove, the lateral lobes thus formed again deeply divided by a narrow U-shape notch, the mesal lobule lying almost on edge with the flattened face directed to the midline; the broader lateral lobes narrowly rimmed with black edge. Ninth sternite relatively inconspicuous, its appendage small, with moderately long yellow setae, contiguous at the midline. Basistyle conspicuous, the posterior edge sharply margined and at its ventral angle produced into an acute spinous point; caudal margin of the style back from this spine flattened and sclerotized on the lower portion, near the dististyle with a rounded notch that is filled with whitish membrane, the dorsal angle of this notch produced into a second, inwardly directed chitinized point; dorsal apical part of style with long black setae. Outer dististyle unique, appearing as a polished scoop, the outer convex face glabrous, the concave inner surface provided with abundant long yellow setae. Inner dististyle not clearly evident in the unique dry type. Eighth sternite sheathing, strongly narrowed outwardly, the tip more or less circular; viewed from below the apex appears truncated and filled with pale membrane; viewed from behind, the sides of the shallow aperture are produced into short polished lobes that bear dense brushes of relatively short yellow setae, the more ventral ones longer and stouter, decussate.

Habitat: California (Monterey County).

Holotype: ♂, Hastings Reservation, along Finch Creek, May 21, 1943 (J. M. Linsdale); Alexander Collection.

I am unable at this time to indicate the exact relationships of this fly. In some regards it suggests species of the subgenus *Hesperotipula* Alexander rather than *Lunatipula* Edwards, where I am placing it. In the latter subgenus it suggests species such as *Tipula* (*Lunatipula*) *splendens* Doane, and allies, but the actual relationship seems distant. It should be noted that the male hypopygium was described from the unique dry type, without mounting or dissection.

Utah Hispinae Beetles: Recently Dr. Milton W. Sanderson checked over a small collection of Hispinae chrysomelid beetles from the Utah State Agricultural College collection, which contained:

Microrhopala vittata Fab. Collected at Vernal, Utah, July 22, 1940; Kaysville, July 21, 1940 (Knowlton); feeding on balsam root, Logan Canyon, Utah (J. S. Stanford); Provo, Utah (Knowlton); Dayton, Wyoming (G. B. Harston); Milton, Oregon (D. R. Maddock); Boise and Bannock, Idaho (Knowlton-F. C. Harmston).

M. xerene Newm. Logan Canyon, Utah, July 26, 1939 (W. P. Nye); Ogden, Utah (D. E. Hardy); Big Hole, Idaho, July 19, 1936 (Knowlton).

M. cyanea Say. Zion National Park, Utah, July 17, 1947 (Knowlton).

Baliosus ruber Web. On oak at Butlerville, Utah, June 16, 1936 (Knowlton).

Anoplitis inaequalis Web. Logan, Utah, June 3, 1949 (W. J. Hanson); Logan Canyon, Utah, July 17, 1938 (A. T. and D. E. Hardy) and July 20, 1940 (Knowlton-D. G. Hall); Bacchus, Utah, June 8, 1949 (Knowlton).

Anisostena sp. Specimens belonging to this genus were collected at Logan, Spring Hollow of Logan Canyon, and at Providence, in Utah. G. F. Knowlton, Logan, Utah.

LIFE HISTORY OF OCHTERUS BANKSI BARBER (HEMIPTERA: OCHTERIDAE).

By M. L. Bobb, Charlottesville, Virginia.

The Ochteridae is a small family of semi-aquatic Hemiptera which is represented by only a few species, and these are remarkably uniform in appearance. No complete life history studies have been published on any of the species although Takahashi (1921 and 1923) published observations on *Ochterus formosanus* (Mats.) which is present in Formosa. Hungerford (1919) stated that while Dufour described a nymph of an undetermined species of the genus *Ochterus,* no data are available concerning the egg, or number and length of the instars. Schell (1943) stated that the life history of the family is little known, but that the eggs are deposited upon the surface of grains of sand, plant detritus, and other similar materials. It has been erroneously assumed by some workers (Hungerford 1919) that the winter was spent in the adult stage.

This paper is a report on the life history of *Ochterus banksi* Barber in Virginia for the years 1948 to 1950.

Methods.

Large aquaria, approximately 12 × 13 × 30 inches, which had a partition about two-fifths the distance from one end were used in rearing individuals of *Ochterus banksi.* The larger end of the aquarium contained seven inches of sand with moss and small clumps of grass growing along the partitioned end. The smaller end was filled with water to a depth of one inch below the level of the sand, and one inch of mud and silt was placed in the bottom in which *Elodea* grew. This water kept the sand extremely moist, and a plate of glass covered the top of the aquarium to permit the keeping of a high humidity within the aquarium.

The different instar nymphs were kept separated by the use of pint fruit jars which had the bottoms removed. The broken end was embedded in the sand, the nymphs put in, food added, and the top closed with a piece of cheesecloth held in place by a rubber band. It was necessary to close the top, since otherwise the nymphs crawled out.

Field collections of the adults were made mostly by picking them up by hand since they hid among the grasses and rocks upon approach of the collector and a net was useless. The nymphs were collected by raking up the debris from an area in which they were

known to be present and confining it in the hopper of a Berlese-type funnel. To the inverted apex of the funnel was attached a jar top into which a pint fruit jar was screwed. The nymphs leaving the debris fell down the funnel and into the jar.

Distribution.

Ochterus banksi has been recorded from New York, New Jersey, Virginia, Florida, and Indiana. There are also specimens from South Carolina in the Clemsen College insect collection.

Barber (1913) described *Ochterus banksi* from specimens collected by Nathan Banks at Glencarlyn, Arlington County, Virginia, and Schell (1943) records it from Vienna, Fairfax County, Virginia.

The writer has a total of 76 field collected specimens from Virginia. These were collected from five localities in Albermarle County and one locality in Alleghany County.

Habitat.

This species lives along the shores of ponds and streams. Specimens have been collected from among shore-line plants and rocks, and from sandy beaches along the shore of ponds and streams. The adults move very rapidly and are "experts" at concealing themselves from view. The nymphs are much slower in movement but are difficult to detect since they carry grains of sand on their backs. *Ochterus banksi* has been observed in the same habitats as *Gelastocoris oculatus*, but apparently they are not congenial associates since the latter have been observed feeding on the former several times.

Life History.

Descriptions of the stages and life history data are presented below.

Egg: The egg is white in color and is broadly oval with the micropyle end flattened, and tapering at the other. One side is somewhat flattened and slightly concave. The surface is marked into irregular areas. Length 0.84 mm., width 0.47 mm. (Fig. 1).

First instar: Light brownish in color. Eyes bright red when first hatched, changing to a brownish-red; only slightly elevated. Abdomen short and broadly rounded caudally, segments faintly indicated. Thoracic segments with flat, expanded lateral margins. From 12 to 14 stout spines in a transverse row along the front of head. Rostrum very long and reaching midlength of abdomen; basal third stout, remainder slender. Antennae slender, apparently

three-segmented; terminal segment longer than two basal segments united; reaching lateral margin of prothorax. Legs short and all similar in structure; tarsi with two terminal claws. Length 1.2 mm., greatest width 1.0 mm. (Figs. 2 and 3).

Second instar: Similar to first instar but lateral margins of thorax and abdomen are widely expanded, and eyes are darker and slightly more protruding, slightly convex on inner margin. Antennae four-segmented; segments 1 and 3 slender, subequal in length; segment 2 very stout, longer than 1; segment 4 long, subequal to 2 and 3 united, tapering to apex. Length 1.8 mm., greatest width 1.4 mm. (Fig. 4).

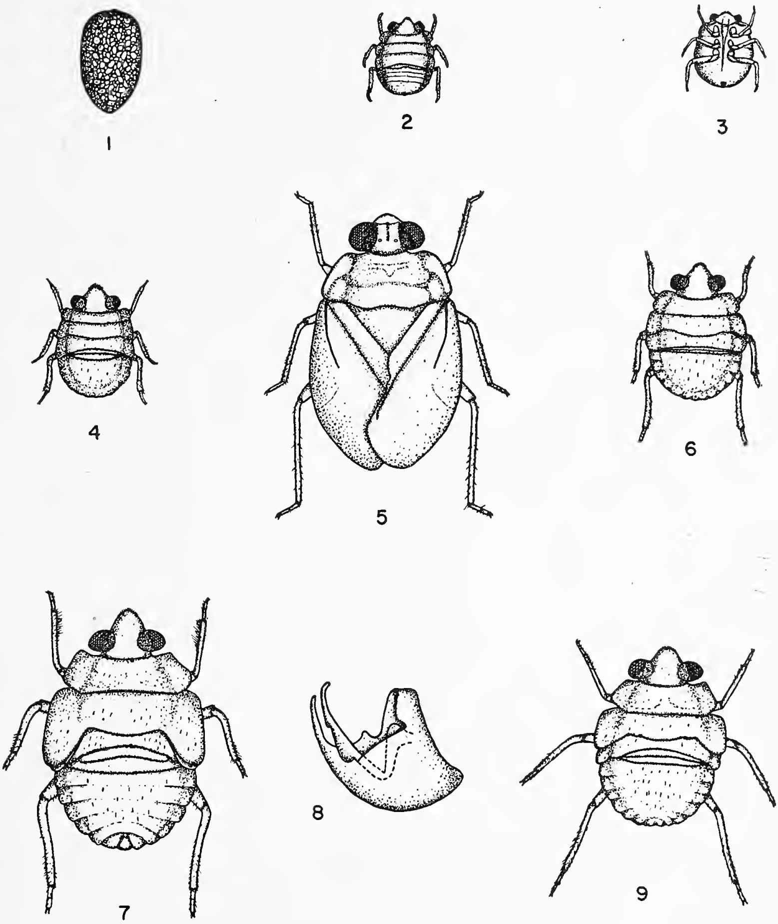
Third instar: Eyes more prominent and protruding, concave on inner margin. Lateral margins of body widely expanded. Rostrum long, and apical two-thirds very slender. Antennae and legs similar to second instar but longer and stouter. Fourteen stout spines in a transverse row on front of head. Wing-pads showing slight development. Length 2.2 mm., greatest width 1.7 mm. (Fig. 6).

Fourth instar: Very similar to fifth instar. Abdomen marked into segments along lateral margins but dorsum appears unsegmented. Antennae with segments 1 and 2 stout, subequal; segment 3 slender, slightly longer than 2; segment 4 slender, as long as 1 and 2 united, tapering to apex. Wing-pads showing more rapid development. Length 3.0 mm., greatest width 2.1 mm. (Fig. 9).

Fifth instar: Nymphs yellowish-white when first molted but soon changing to a light brownish color. Integument shiny when coating of mud and sand is removed. Eyes dark brownish-black, strongly protruding and elevated. Lateral margins of thorax and abdomen broadly expanded. Fourteen stout spines in transverse row along front of head. Rostrum long and slender, reaching beyond hind coxae. Antennae with segments 1 and 2 stout, subequal; segments 3 and 4 slender, subequal, each slightly shorter than 1 and 2 united. Middle tibiae slightly curved and hind tibiae strongly so; tarsi with two large claws. Mesothoracic wing-pads extending caudally to first abdominal segment, nearly obscuring the metathoracic wing pads. Length 4.0 mm., greatest width 2.7 mm. (Fig. 7).

Adult: Broad ovate, brownish-black. Head behind vertex opaque, from there cephalically, shining and obliquely, finely rugulose and tricarinate. Pronotum with cephalic margin subtruncate, the cephalolateral angles rounded and not projecting cephalid or lateral beyond the exterior margin of eyes; lateral margins broadly

BULL. B.E.S. VOL. XLVI PLATE V



EXPLANATION OF PLATE V

All figures are of *Ochterus banksi* Barber. FIG. 1. Egg. FIG. 2. First instar nymph, dorsal view. FIG. 3. First instar nymph, ventral view. FIG. 4. Second instar nymph. FIG. 5. Adult. FIG. 6. Third instar nymph. FIG. 7. Fifth instar nymph. FIG. 8. Genital capsule of male. FIG. 9. Fourth instar nymph.

expanded, pale. Costal margins of corium either broadly pale or in part suffused with fuscous, without the usual series of pale marginal spots which occur in *americanus*. Right paramere of male genital capsule with semi-heart-shaped lobe on outer margin (Fig. 8). Length 4.1 mm. to 4.5 mm. (Fig. 5).

A general picture of the life history of *Ochterus banksi* is shown by seasonal collecting data. Adult males and females have been collected in approximately equal numbers during late May, June (majority), and early July; second instar nymphs during July, August, and early September; third instar nymphs during August and September; fourth instar nymphs during January, February, March, April, August, September, October, November, and December; and fifth instar nymphs during April, May, and June.

From these collecting data it can be seen that the winter is passed in the fourth nymphal stage, the nymphs hibernating under leaves, among mosses, and in other debris along the shores of ponds and streams. The nymphs will not progress beyond the fourth instar until subjected to cold weather, even though they reach the fourth nymphal stage in late July or early August. A number of fourth instar nymphs have been subjected to refrigeration for varying intervals, and it was found that they require a minimum period of two weeks of temperatures of 45° F. or less to cause them to continue development.

After passing the winter as fourth instar nymphs they molt in early spring into the fifth instar, and become adults in May and June. Several weeks elapse after the final molt before eggs are found in the oviducts. Dissections of numerous females have shown that egg development is a slow and gradual process, and that no more than two or three apparently mature eggs are present in the oviducts at one time. About 25 to 30 was the maximum number of eggs produced by a female in captivity, and this number was developed over a period of approximately two months. The eggs are deposited singularly on plant debris and on grains of sand. In the aquaria the majority of the eggs were found attached to semi-exposed roots of grass clumps and to dead grass and leaves.

In nature the first instar nymphs remain in clumps of mosses and among the grasses growing along the shore and are extremely difficult to find. The older nymphs wander from under the debris and move slowly over the sand or mud, and have been observed in shallow water. All stages of nymphs are covered with a thin coating of silt which is almost impossible to remove from their dorsa, and all carry from two to six grains of sand on their backs. They

scoop up the sand by means of the transverse row of stout spines on the front of the head and push it back onto the thorax and abdomen with the front pair of legs. This is a characteristic of all nymphal stages and if the sand grains are removed, as has often been done with a camel's-hair brush, they begin putting more sand on their backs within a very short time.

A day or two before each molt the nymphs construct small individual cells in the moist sand. After they are in the cells, sand is pushed up along the sides until only a very small hole is left in the top. The nymph remains motionless in the bottom of the cell for a few hours or a day and then the old integument splits along the mid-dorsal line of the thorax and the newly molted nymph crawls out. After a short time it leaves the cell and roams around in search of food. The exuva is left in the cell.

The adults and nymphs feed on various small insects and crustacea. One fourth instar nymph was observed feeding on a crus-

TABLE 1

Summary of life history data on *Ochterus banksi* Barber at Charlottesville, Virgina in 1948–1949.

Individual Number	Length of egg stage and nymphal instars in days						
	Egg	First	Second	Third	Fourth	Fifth	Total
1	17	13	8	23	208	23	292
2	18	11	10	36	196	27	298
3	18	12	9	37	201	24	301
4	18	13	10	40	201	22	304
5	19	12	10	39	205	21	306
6	18	13	11	36	204	23	305
7	20	11	12	34	208	18	303
8	19	16	11	34	207	20	307
9	18	12	10	33	204	22	299
10	20	12	13	34	202	21	302
11	19	13	15	31	198	26	302
12	21	12	11	33	199	26	302
13	19	15	14	34	194	25	301
14	20	12	21	35	183	28	299
15	18	12	17	36	181	24	288
Average	18.8	12.6	12.2	34.3	199.4	23.3	300.6

tacean (*Gammarus* sp.) fully three times the size of the nymph. In the life history studies they were fed on springtails, fly larvae, and aphids. The adults were very shy but always demonstrated curiosity. If a large insect was dropped into the aquarium the adults would soon investigate, but the nymphs seemed to find the food more or less by chance. *Ochterus banksi* is not cannibalistic, even when food is extremely scarce. The adults have fully developed wings but they have never been observed to fly in the laboratory or

TABLE 2

Summary of life history data on *Ochterus banksi* Barber at Charlottesville, Virginia in 1949–1950.

Individual Number	Length of egg stage and nymphal instars in days						
	Egg	First	Second	Third	Fourth	Fifth	Total
1	20	14	12	29	215	22	312
2	18	12	12	22	223	26	313
3	18	13	9	26	226	24	316
4	18	13	11	31	212	22	307
5	21	15	12	34	216	23	321
6	21	14	14	32	219	24	324
7	19	17	10	41	214	18	319
8	22	11	11	29	213	28	314
9	18	13	13	40	202	25	311
10	18	13	14	39	220	24	328
11	19	13	12	39	197	25	305
12	20	12	13	38	209	26	318
13	18	14	12	38	219	25	326
14	20	11	14	36	207	23	311
15	19	13	12	37	222	21	324
16	18	12	17	32	204	23	306
17	18	12	13	35	218	23	319
18	20	14	14	37	217	20	322
19	17	12	14	27	229	27	326
20	18	11	19	32	216	25	321
21	15	12	14	36	208	22	307
22	16	12	13	35	214	25	315
23	17	13	15	30	216	21	312
Average	18.6	12.8	13.0	33.7	214.6	23.6	316.4

in nature. They sometimes jump when startled, but usually run along the ground.

The life history data presented in tables 1 and 2 were obtained from studies of the insect in a large aquarium in a building which was kept at a constant temperature of 75° F. In order that the nymphs might continue development past the fourth instar they were transferred during December to other aquaria in an open insectary. The nymphs were left in these outdoor aquaria until they began to molt into the fifth instar. As soon as molting began all nymphs were transferred back to the aquarium in the heated building where they completed their development. Due to this it will be noted in the tables that the average duration of the egg and nymphal stages for the two years very closely approximate each other, except that the fourth instar was longer in 1949–1950 than in 1948–1949. This longer period in the fourth instar is more normal. The mid-February temperatures in 1949 were unusually high (67° F. on the 13th, 69° F. on the 14th, and 72° F. on the 15th), and caused the nymphs to begin molting. Since the nymphs were transferred to the aquarium in the heated building in late February, the fourth nymphal period was lessened. The date the eggs were deposited in 1948 varied from June 2 to July 3 and in 1949 from May 18 to June 26, and hatched from June 19 to July 21 in 1948 and from June 7 to July 13 in 1949. The nymphs molted to the second instar from July 2 to August 2 in 1948 and from June 21 to July 26 in 1949; to the third instar from July 10 to August 23 in 1948 and from July 1 to August 10 in 1949; to the fourth instar from August 2 to September 27 in 1948 and from July 25 to September 9 in 1949; to the fifth instar from February 26 to March 25 in 1949 and from March 18 to April 2 in 1950; and to the adult from March 20 to April 21 in 1949 and from April 9 to May 8 in 1950.

Data are presented only for a two-year period although a number of individuals were reared in 1947. During 1947 the data were confused due to the failure to distinguish between the exuvia in the "molting cells" and the living nymphs, and not until more nymphs were present in the aquarium than had been placed there was it realized that this distinction had not been made. Even though the 1947 data was of little value, much was learned of importance in later studies. One of the most beneficial findings was that the nymphs need moist sand and a high humidity in order to molt successfully. A high percentage of the individuals were unable to transform into the next instar in a dry atmosphere although

they seemed to do well between molts. The average number of days in the fifth instar for seven individuals reared in early 1948 and not included in tables 1 and 2 was 24.7.

Summary.

Life history studies on *Ochterus banski* Barber are presented for the years 1948 to 1950, and descriptions of all life stages are given and figured.

The eggs are deposited singularly on semi-exposed roots of grass clumps and on plant detritus, and hatch in from 15 to 22 days. The first nymphal instar lasts from 11 to 17 days, the second instar from 8 to 21 days, the third instar from 22 to 41 days, the fourth instar from 181 to 229 days, and the fifth instar from 18 to 28 days.

The winter is passed in the fourth nymphal instar, the individuals hibernating under leaves, among mosses, and in other debris along the shores of ponds and streams. The nymphs will not progress beyond the fourth instar until subjected to a minimum period of two weeks of temperatures of 45° F. or less.

All nymphal stages construct small individual cells in the moist sand in which they molt.

All nymphal stages carry from two to six grains of sand on their dorsa. These are scooped up by means of a transverse row of stout spines on the front of the head and pushed back onto the thorax and abdomen with the front pair of legs.

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NEW SYNONYMY OF A FEW GENERA AND SPECIES OF ANTS.

By WILLIAM L. BROWN, JR., Cambridge, Mass.

Following are some ant names considered to be synonymous. The synonymy is indicated in the standard way, with the senior name given first and junior names, with other important references, given under each senior name. This is a continuation of the attempt on the part of the author to stress the importance of making perfectly obvious and uncomplicated synonymy a part of public scientific knowledge. Of some 10,000 names of ants currently in print and unchallenged, probably nearly one half are synonyms. Myrmecologists everywhere should seek to place publication of synonymy definitely known to them as a consideration with priority over the description of new species. If this is not done, ant systematics will soon become a field in which constructive work is impossible.

Calyptomyrmex beccarii Emery

Calyptomyrmex beccarii Emery, 1887, Ann. Mus. Civ. Stor. Nat. Genova, (2) V, pp. 471–472, Pl. 2, fig. 23, worker. 1897, Term. Füzetek, XX, p. 587 (New Guinea record). Szabó, 1910, Ann. Mus. Nat. Hung., VIII, p. 365, female (New Guinea record).
Weberidris rufo-brunnea Donisthorpe, 1948, Ent. Mon. Mag., LXXXIV, p. 281, fig. 1, worker (New synonymy).
Calyptomyrmex rufo-brunnea Donisthorpe, 1949, Ent. Mon. Mag., LXXXV, p. 186, worker. Brown, 1949, Trans. Amer. Ent. Soc., LXXV, p. 84.

When the synonymy of *Weberidris* was pointed out to Mr. Donisthorpe, he quickly published the synonymy of the genus, but retained the species *rufo-brunnea* as distinct from Emery's *beccarii*. I have recently been able, through the courtesy of the original collector of *rufo-brunnea*, Dr. E. S. Ross, to see six specimens of what is almost certainly the same species from the type locality, Maffin Bay, Dutch New Guinea.

These specimens are undoubtedly of *Calyptomyrmex beccarii*. Not only does the species have a previously long-known wide distribution along the northern coast of New Guinea, but the very characters cited by Donisthorpe in 1949 are just those that vary in the specimens before me. Since Emery habitually undermeasured small ants, the size difference ($3\frac{1}{2}$ mm. *teste* Emery; 3.7 mm. *teste* Donisthorpe) is completely inconsequential. The mandibular

dentition is somewhat variable, grading from a nearly edentate condition to one in which up to six low teeth are visible. The dentition is hard to see, and Emery shows it ambiguously, his original description differing from the accompanying figure in what would appear to be extremes of mandibular armament. The figure accompanying the description of *W. rufo-brunnea* seems rather strongly in error as regards major details of sculpture and pilosity.

The *Calyptomyrmex* determined as *beccarii* by Wheeler in the Museum of Comparative Zoology is a closely related but distinct species in my opinion. It differs from *beccarii* and from *emeryi* Forel in sculpture and in the position and size of the individual clavate hairs; this apparently new form is from the Philippines, but deserves further study before a description is warranted. *C. emeryi* differs from *beccarii* in having a nearly smooth propodeal face; the face in *beccarii* is roughly rugose in a more or less vertical direction. According to Donisthorpe, the New Guinea species has both labial and maxillary palps with two segments.

Prionopelta majuscula Emery

Prionopelta majuscula Emery, 1897, Term. Füzetek, XX, pp. 595–596, worker, female.

Examblyopone churchilli Donisthorpe, 1949, Ann. Mag. Nat. Hist., 11 (XV), pp. 401–402, female. (New synonymy.)

Mr. Donisthorpe has returned two of the original three *churchilli* types to the California Academy of Sciences. The holotype consists of the alitrunk only, while the paratype examined by myself has had the back of the head removed, and the remainder of the cephalic capsule is badly distorted. Evidently this happened while the examination of the palpi was being made. In spite of the distortion, the paratype specimen is clearly identifiable as a *Prionopelta* female. Agreement with Emery's description of *P. majuscula* is so close as to leave little doubt that the above synonymy is in order, provided one makes the usual allowances for Emery's low measurement. The genus *Examblyopone* quite definitely is a synonym of *Prionopelta*. Since, in my opinion, *Prionopelta* is a member of the tribe *Amblyoponini,* I must consider Donisthorpe's tribe *Examblyoponini* (loc. cit.) a synonym also. Donisthorpe found the type females in this case to have two-segmented maxillary and labial palpi, and since this also appears to be the number in at least one Neotropical species, the number is probably to be considered characteristic for *Prionopelta.*

Myrmecina americana Emery

Myrmecina latreillei subsp. *americana* Emery, 1895, Zool. Jahrb. Syst., VIII, p. 271, worker.

Myrmecina americana Brown, 1949, Psyche, LVI, pp. 44–47, worker. Creighton, 1950, Bull. Mus. Comp. Zool., CIV, pp. 246–250, with subspp. *brevispinosa* and *texana.*

Myrmecina graminicola subsp. *texana* Wheeler, 1908, Bull. Amer. Mus. Nat. Hist. XXIV, p. 422, worker (New synonymy).

In my treatment of the forms of *Myrmecina* of North America cited above, I synonymized Emery's variant *brevispinosa* after finding nests near Boston of the "typical" *americana* which, upon being starved in an artificial nest, produced small, lightly colored and lightly sculptured workers corresponding well to the description and supposedly authentically determined specimens of *brevispinosa.* At the time of publication of my article, Dr. Creighton's magnificent work on the North American ants was in the hands of the printers, and this seemingly irrefutable evidence for the synonymy of *brevispinosa* came too late for consideration under his treatment of *Myrmecina* (loc. cit.).

In the face of the biological evidence, it is impossible to support *brevispinosa* as a geographical race or as an intergrade between *"americana americana"* and a western race. Dr. Creighton is, of course, correct in stating that series from the southwestern United States average smaller, are often lighter in color, have smaller propodeal teeth and are more lightly sculptured. An extreme in these respects is reached by M. R. Smith's *M. californica,* which may, when collections from the West are more complete, prove to be one end of a gradual cline. Such a cline could, of course, occur as a chain of natural species or subspecies; the evidence in the form of actual series in collections is at present much too slight to support any definite generalizations on the subject.

Adding to the complexity of the taxonomic situation with regard to Holarctic *Myrmecina* is the recent discovery, by Dr. D. L. Wray at Pittsboro, North Carolina, of two very small, smooth *Myrmecina* workers, light in color and with greatly reduced propodeal armament. The head, alitrunk and nodes of these workers are scarcely more than feebly coriaceous, and in smoothness surpass all other *Myrmecina* of the *graminicola* group including the form *sicula* Emery and *californica.*

My opinion of this situation is derived from the study of very numerous representatives of over one hundred colonies of *Myrmecina* from the Nearctic and Palearctic regions, including types or

reliably determined specimens of all the named forms except *M. graminicola grouvellei Bondroit.* Since all characters of sculpture, color, clypeal and antennal scape structure, etc. formerly used in separating the various forms will not hold perfectly constant for all specimens in the *major* areas of the Holarctic region, we may well question whether any of them are worth much. Specimens from northern Europe appear to be relatively uniform in their large size, coarse sculpture, flattened bases of antennal scapes and in the relatively strong development of lateral and median clypeal teeth. Most individuals from the northeastern United States and eastern Canada are nearly as large and roughly sculptured as the northern European ones, but the clypeal teeth are much reduced and the scapes are narrow and curve evenly at their bases, with little or no trace of flattening.

As one goes south in the Mediterranean area and south and west in North America, *Myrmecina* becomes gradually more and more uncommon, the size of the individuals and the strength of the sculpture decreases, and the shapes of the bases of the scapes and of the clypeal processes lose the distinctness of the populations from the cooler, wetter areas. The scanty evidence from the Orient shows that there is a mixture of types in eastern China and Japan with regard to the scape and clypeal characters. It is doubtful whether these Oriental forms can be separated from *M. graminicola,* although at least the Chinese form is intermediate to *M. americana.*

All of this evidence, while not yet strong enough to be at all conclusive, points to the origin in Asia of the *graminicola* group (the other *Myrmecina* species are Indo-Papuan) and a spreading to Europe and North America (during relatively recent geological periods) of a variable *graminicola*-like species. The populations of eastern North America and western Europe therefore rest on opposite ends of a range stretching a great part of the way around the Northern Hemisphere, and it is not surprising that they show the most constant differences. For the maximum display of the full differences, the individuals seem to require optimum conditions with regard to temperature, humidity and food which are not found in the warmer or warmer and dryer parts of the ranges. Therefore, it seems that the latter areas produce forms depauperate not only in sculpture, propodeal teeth and general body size, but also in the development, be it positive or negative, of the scape and clypeal characters.

Whether the north-south variation is partly due to genetic fac-

tors as well as to environmental ones remains for experiment and observation to verify; the small amount of material now available, plus the variation brought about in the artificial nests by starvation, seems to indicate in a rough preliminary way that the smoother forms are non-genetic or largely so in North America. Menozzi and others have indicated briefly that smooth South European forms like *sicula* did not seem worthy of taxonomic distinction because of the variability of the characters discussed.

In my previous discussion of the Holarctic *Myrmecina,* I indicated that *texana* would probably have to be considered a synonym of *americana* when more collections from the southwestern United States were known, since the characters cited by Wheeler in the original description could be matched by specimens from nests coming from much farther north and east. I reserved judgement at that time because of certain differences that appeared to exist in the cephalic sculpture of the *texana* types. Since that time, I have been able to compare much more material with the *texana* specimens, and I can only conclude that my original opinion was correct.

Since Dr. Creighton (loc. cit.) has retained *texana* as a valid subspecies, I have found it prudent to examine *texana* most carefully for a third time, and I am now completely confirmed in the synonymy listed above. This case has little to do with north-south or other variation as discussed above; *texana* is just not distinct by any character from nest variants stemming from Ohio, Kentucky, Pennsylvania and North Carolina and occurring in the same colonies with more "normal" specimens.

Dr. Creighton states, "When more material is available for examination, *texana* will probably prove to be a separate species, for it has rather distinct structural features which separate it from *americana.*" However, the only character actually mentioned by Dr. Creighton (in the key to the work cited) is the "finely punctate and subopaque" base of the first gastric segment. As I have already pointed out during the time when "The Ants of North America" was still in press, this character is certainly the last one would pick to separate any subspecies from *americana,* since virtually all specimens I have seen of *M. americana* from the northeastern United States show more or less strong shagreening of the gaster. This shagreening is of the same kind shown by the *texana* types, and in specimens from northern Ohio and North Carolina definitely surpasses that of the *texana* types in strength and distinctness. *Texana* is just another name which has stood through the years by default of really critical examination.

In addition to the North American synonymy, I should like to suggest some synonymy for *M. graminicola* which appears quite safely put forward at this time. All of the names considered are European or are from adjoining areas; lack of mention of *sicula* and the Asiatic subspecies does not mean that I consider these forms above synonymy, but merely indicates that the material at hand is insufficient for the certain consummation of the synonymy at the present time.

Myrmecina graminicola (Latreille)

Formica graminicola Latreille, 1802, Fourmis, p. 256, male, not worker or female.

Myrmica striatula Nylander, 1849, Acta Soc. Sc. Fennicae, III, p. 40, worker (New synonymy).

Myrmecina graminicola var. *Grouvellei* Bondroit, 1918, Ann. Soc. Ent. France, LXXXVII, p. 116, fig. 58c (New synonymy).

Myrmecina kutteri Forel, 1914, Deux nouv. myrmécol., p. 1, as worker. (See Emery, 1915–16, Rend. Accad. Sc. Bologna, p. 57) (New synonymy).

In the reference just cited, Emery placed *striatula* as a variety of *graminicola* and *kutteri* as an "aberration" of the same species. Signor Mario Consani has kindly sent me two specimens of *striatula* labelled "Lenkoran," so I take them to be authentic. These prove to be slightly less strongly sculptured variants of *graminicola,* and can scarcely be said to merit taxonomic distinction. Aberration *kutteri* is no more than the ergatoid (wingless) female form of the ordinary *M. graminicola* from Switzerland and Italy; it is quite commonly found in nests with "typical" *graminicola* workers.

The var. *grouvellei* appears to be a depauperate form of *graminicola:* while the clypeus shows some reduction of the teeth, especially the median one, the differences do not appear strong enough (from Bondroit's figure) to warrant taxonomic distinction of this form in the face of the great variation recorded for *graminicola* in southern Europe outside France. Further study will probably show that *grouvellei* is merely one of the intermediates between *graminicola* and an ecological variant represented by the very doubtful species *sicula.*

A NEW WATER BEETLE FROM FLORIDA, WITH A KEY TO THE SPECIES OF DESMOPACHRIA OF THE UNITED STATES AND CANADA (COLEOPTERA; DYTISCIDAE).[1]

By FRANK N. YOUNG, Bloomington, Indiana

The new species of *Desmopachria* described below is apparently isolated from other members of the genus, but most closely related to *D. mutchleri* Blatchley (1919: 309). It may represent another relict population of the stock from which *mutchleri* was derived.

Desmopachria seminola n. sp.

DIAGNOSIS: A small rather narrowly ovate member of Zimmermann's Group I (1919: 130), about intermediate in many respects between *dispersa* (Crotch, 1873: 388) and *mutchleri* but more narrowly ovate and more convex than either. Elytral markings reduced as in *dispersa,* but suggesting the general pattern of *mutchleri.* Each elytron with a submarginal and discal longitudinal mark which are united posteriorly, but the submarginal is broken at the middle and the discal mark is not united with the darkened suture; vertex of head without dark markings; pronotum narrowly darkened at the base.

Holotype Male: Moderately ovate, rather convex. Total length, 2.08 mm.; greatest width (at basal third of elytra), 1.57 mm. *Head:* Rather narrow, the clypeus evenly rounded. Vertex finely, sparsely punctate, the punctures rather irregular in shape and distribution. (More finely and less densely punctate than in *mutchleri;* less finely and densely punctate than in *dispersa.*) Width between eyes 0.29 mm. *Pronotum:* Disk moderately finely punctate, more coarsely and sparsely than head. (Less coarsely and densely punctate than in *mutchleri;* about as finely, but less densely than in *dispersa.*) Punctures mostly separate, not confluent, coarser along base, apex, and near the lateral plicae. Plicae distinct, extending a little over half distance from base to apex (about $\frac{1}{2}$ as long as lateral margin of pronotum.) Width at base, 1.19 mm.; apex, 0.76 mm.; length along midlines, 0.41 mm. *Elytra:* Coarsely, rather closely punctate, the punctures separated by from 1 to 2 times their diameter. (Less coarsely and densely punctate than in *mutchleri;* about as coarsely, but more densely than in *dispersa.*)

[1] Contribution No. 470 from Department of Zoology, Indiana University.

Punctures along suture coarser, a sutural stria evident (only vaguely indicated in some specimens of *mutchleri*), but without indication of other elytral striae. *Venter:* Metacoxal plates moderately coarsely, sparsely punctate, the punctures separated by from 1 to 4 times their diameter. (Less coarsely and densely punctate than in *mutchleri;* about as coarsely, but more sparsely than in *dispersa.*) *Color:* Head uniformly light yellowish brown without darker markings on the vertex. Pronotum slightly darker than the head with a narrow darkened area between the plicae along the base, not reaching the plicae, but appearing to continue the elytral markings. Elytra light yellowish brown, in part lighter than head and in part with slight reddish cast. Suture bordered by dark brown stripes diverging at base and narrowly bordering bases of elytra adjacent to pronotum. Discal and submarginal dark brown marks united basally, but not united to sutural stripe, an anterior part of submarginal mark almost completely detached as in many specimens of *dispersa,* unlike the pronounced "W" shaped pattern in *mutchleri* (see Fig. B). Venter, mostly yellowish brown with a reddish cast. Legs, antennae, etc. light yellowish brown. Metacoxal plates with reddish cast.

Holotype male from Jackson County, Florida (3.2 miles north of Marianna on Fla. Hgw. 71), Oct. 19, 1941, Mr. and Mrs. C. J. Goin, L. J. Marchand, and F. N. Young, in University of Michigan Museum of Zoology.

The situation from which *seminola* was taken as it appeared in October, 1941, is described in some detail by Carr & Goin (1943). Collections were made from what appeared to be a recently excavated road metal pit, relatively shallow, and apparently temporary since fairy shrimp were present in some numbers. The bottom was composed of silty red clay, and the water was reddish in color with suspended materials. In many respects this pond resembled the ephemeral pools on the Mexican plateau from which neotenic axolotyls are taken, and neotenic *Ambystoma* were present along with countless corixids.

By the summer of 1949 this pond had stabilized and become permanent or semipermanent, which may or may not have been correlated with a general rise in the water level in lakes in North Central Florida during the same period. The bottom was no longer easily roiled up, and the water was clear and considerably deeper than in 1941. Intensive collecting failed to produce any specimens of *Desmopachria seminola* or of *Eretes sticticus* (Linnaeus) which was taken in the pool on October 11 and 19, 1941.

These observations together with those made on the related *Desmopachria mutchleri,* suggests that *seminola* is a characteristic member of the fauna of moderately large temporary ponds, which are present most of the year but periodically dry up. Such ponds occur most frequently in Florida in the so-called "upland" areas where there is some clay underlying the soils.

The following key, prepared from descriptions and comparison of specimens, may prove of assistance in separating the described species of *Desmopachria* found in the United States and Canada. I have had relatively few specimens of the western forms at hand, but have used H. B. Leech's excellent paper on the aquatic beetles of Lower California (1948) and typical specimens kindly sent by him. At present the various species of Group I appear to be remarkably distinct, but further collecting will probably reveal many intermediate populations. The members of Group III are in great need of revision, but such a revision will require more material from many places in the United States and Central and South America than is now available. A preliminary investigation by H. B. Leech has shown that there are at least three distinct forms of *grana* LeConte in Florida, so that until a revision is possible, it seems best to refer to these as the "*grana* complex."

Key to the Described Species of Desmopachria Found North of Mexico

1. Each elytron with a sutural stria (rarely obsolete in some individuals); pronotum with small basal impressions (plicae) on either side of middle; yellowish or yellowish brown species with distinct dark elytral markings, Group I . . . 2

   Elytra without sutural striae; pronotum without basal plicae; small reddish-brown or brown species, without distinct elytral markings, Group III 6

2. Each elytron with an antemedian longitudinal impression in a marginal reddish spot; pronotum with a small area adjacent to each plica distinctly depressed; punctations of disk of pronotum as coarse and sparse as that of elytra; elytra yellow or yellowish brown, an elongate black spot slightly posterior and mesad of lateral reddish spot; suture broadly, sinuately black, the band widest at middle and posteriorly, narrowed apically, its whole shape campanulate. Length 2.0 to 2.3 mm. Lower California, California. (Fig. E) *latissima* LeC.

Elytra without antemedial lateral impressions and reddish spots; areas adjacent to pronotal plicae not markedly depressed; punctures of disk of pronotum much finer and denser than those of the elytra; elytral markings not as described above 3

3. Vertex of head with dark basal markings; discal and sutural dark markings of elytra united; metacoxal plates relatively coarsely and densely punctate 4

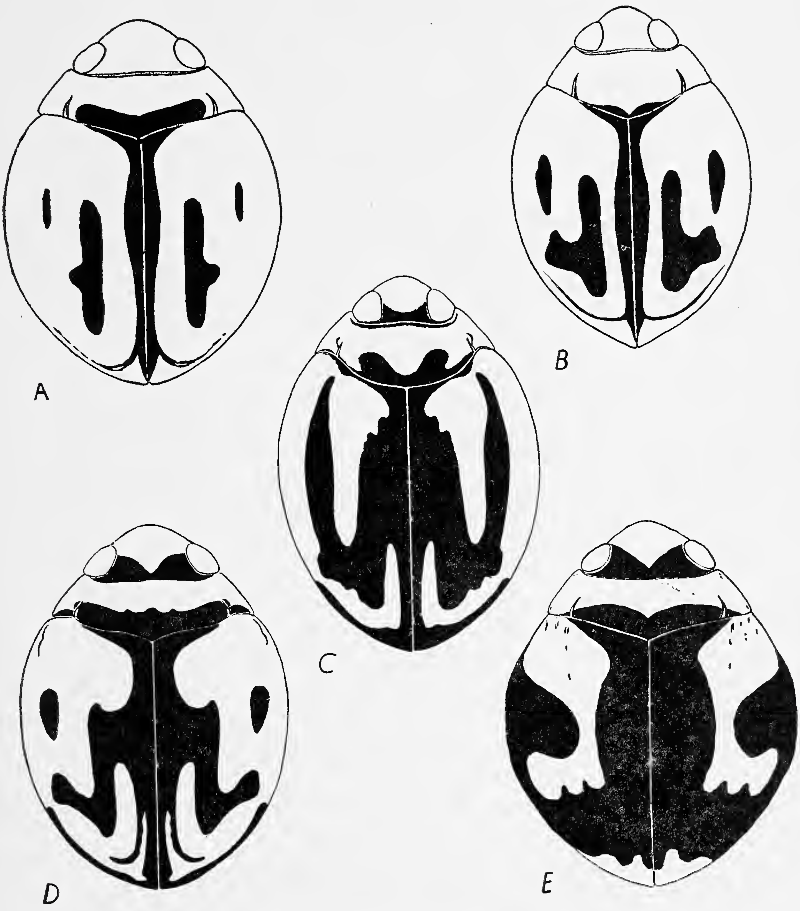
Vertex of head without dark markings; discal and sutural dark markings not united (all dark markings reduced); metacoxal plates more finely and sparsely punctate 5

4. Discal and submarginal dark markings of elytra connected (sometimes united with basal dark markings of elytra), the whole forming a large "W"; discal punctation of pronotum relatively coarse and dense, only slightly finer than on elytra; metacoxal plates coarsely and deeply punctate. Length 2.1 to 2.3 mm. Peninsular Florida. (Fig. C)
mutchleri Blatchley

Discal and submarginal dark markings of elytra separate, the latter often broken into two separate blotches; discal punctation of pronotum distinctly finer than on elytra; metacoxal plates relatively coarsely, but shallowly punctate. Length about 2.2 mm. Mexico, Arizona. (Fig. D)
mexicana Sharp

5. Form broadly ovate, somewhat depressed; elytra and pronotum rather coarsely and densely punctate; metacoxal plates relatively coarsely and densely punctate. Length 2.0 to 2.3 mm. Lower California, Texas, Arizona, New Mexico. (Fig. A) . . . . *dispersa* Crotch

Form more narrowly ovate, more convex; elytra and pronotum more finely and less densely punctate; metacoxal plates somewhat more finely and less densely punctate. Length about 2.1 mm. Western Florida. (Fig. B)
seminola Young



EXPLANATION OF PLATE VI

Semi-diagrammatic drawings of color pattern of various species of Desmopachria. A. *D. dispersa* (Crotch) Type, MCZ 1197, California. B. *D. seminola,* Holotype, Jackson Co., Florida. C. *D. mutchleri* Blatchley, Broward Co., Florida. D. *D. mexicana* Sharp, Bear Canyon, Tucson, Arizona. E. *D. latissima* (LeC.) Type, MCZ 5978, California. Figures A, B, and E prepared from pencil sketches of types. Figures C and D original drawings by Miss Grace E. Coogle.

6. Size larger, about 1.8 mm., more convex; metacoxal plates finely punctate. Canada and New York to Indiana. *convexa* LeC.
   Size smaller, about 1.0 to 1.7 mm., less convex; metacoxal plates coarsely to imperceptibly punctate. Louisiana to Florida and southern Georgia .... "*grana* complex"

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Another Biting Leafhopper: While working with large numbers of beet leafhoppers, *Circulifer tenellus* (Baker), the writer has on many occasions felt irritation upon the face, neck, and arms where individuals of this species had settled and attempted to feed. During August of 1929, several thousand specimens of *C. tenellus* were collected and brought to the Utah Agricultural Experiment Station for inoculation purposes. A large number of specimens escaped from a large cage which was transported in the rear seat of the car the writer was driving. The escaped leafhoppers kept settling upon the exposed parts of the writer's body. Also I observed my companion, M. F. Bowen, to repeatedly slap his arms and neck as though mosquitoes were present. Each time he killed or dislodged a winged beet leafhopper. After calling his attention to the cause of the annoyance we both made careful observations which confirmed our belief that the repeated irritation was produced by the mouthparts of this tiny leafhopper. This is just one of many leafhopper species which have "bitten" me. Usually such irritation has occurred when my body was moist with perspiration. Often such "biting" has been noticed as I sat, pinning insects on summer evenings beneath drop-cord lights in tourist cabins.—G. F. Knowlton, Logan, Utah.

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CONTENTS

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STUDIES ON THE COLEOPTERA OF THE PACIFIC NORTHWEST IV: CARABIDAE, DYTISCIDAE, GYRINIDAE.

By Melville H. Hatch, Seattle, Washington

Unless otherwise noted, the specimens on which this study is based are in the collection of the author at the University of Washington. The author acknowledges his thanks and appreciation to the several collectors and curators who have permitted him to study and describe this material and, in some cases, to retain all or a portion of the specimens in his collection.

Family Carabidae

Elaphrus **Neoelaphrus** n. subg.

Generitype: *Elaphrus uliginosus* Fab. This name is made necessary by Andrewes (Ann. Mag. Nat. Hist. (10) XVI, 1935, p. 16) pointing out that the type of the genus is *Elaphrus riparius* Fab., leaving Semenov-Tian-Shanski's *Elaphrus* s. str. without a name. In addition to *uliginosus* Fab., the subgenus *Neoelaphrus* will include *cupreus* Duft. and, in North America, at least *clairvillei* Kby., *laevigatus* LeC., *olivaceus* LeC., *cicatricosus* LeC., *obliteratus* Mann., and *fuliginosus Say*. It is distinguished from the subgenera *Elaphrus* s. str. (= *Trichelaphrus* Sem.) and *Elaphroterus* Sem. by its sparsely punctate upper surface.

Trechus (s. str.) **pugetensis** n. sp.

Above nearly black, impunctate, shining, iridescent, the elytra especially strongly so, the antennae and legs rufotestaceous, the ventral surface black or dark rufous, slightly iridescent; eyes prominent; pronotum about two-thirds as long as wide, the side margins

very narrowly deplanate, more widely so towards the more or less rectangular hind angles, in front of which the side margin is sinuate, the basal impressions distinct, the basal margin just within the hind angles appreciably but narrowly flattened; elytra with the three to five inner striae well impressed and distinctly punctate especially basally, the outer striae feeble but present, the humeri distinct; male aedeagus with the median lobe in dorsal view slender with the sides subparallel, the apex broadly rounded; length 5–5.3 mm.

Type male: Seattle, Wash., IV-19-1939; four paratype males: Seattle, Auburn, Green River Gorge (King Co.), and Seaview, all in western Washington. Four females from Seattle, Green River Gorge, and Nasel River (Pacific Co.), western Washington, are referred to *pugetensis* with considerable certainty.

Similar in general appearance to *chalybaeus* Dej. subsp. *californicus* Mots., that occurs in the same territory, but distinguished externally by its very slightly larger size and darker color. The diagnostic character of *pugetensis* is, however, the shape of the aedeagus in dorsal view, which in *chalybaeus* is spatulate, oval towards the apex and appreciably constricted behind.

Trechus (s. str.) **oregonensis** n. sp.

Similar to *pugetensis* sp. n. and *chalybaeus* Dej. subsp. *californicus* Mots. in general external appearance, but slightly smaller; male aedeagus with median lobe much larger than in either of those species, the apex in dorsal view stout, suddenly convergent towards the extreme apex which is very narrowly rounded and dorsally deflected, the distance from the apex to the point where the convergence begins being little greater than the width of the median lobe at the same point; length 4.3 mm.

Type male: Hood Rv. Rapids, Parkdale, Ore. July 30, 1921, M. C. Lane Coll.; paratype male: Creston, B. C., 6-vi-1937, G. Stace Smith (in collection of the collector).

Coloradensis Schaef. subsp. *arcticollis* Jean. from north Idaho has the median lobe of the aedeagus similarly gradually convergent apically, but the entire median lobe is much smaller and narrower, the distance from the apex to the point where the convergence begins is about one and one-half times the width at the same point, and the apex is not deflexed.

Bembidion (Chrysobracteon) grahami n. sp.

Aeneous black, shining, alutaceous, the venter more finely alutaceous and less strongly aeneous, the three basal antennal segments

and the extreme bases and the legs and extreme apices of the femora obscurely paler; above strongly alutaceous, the elytra more strongly so and without smooth spaces, the foveae marked by two slightly depressed areas in the third interval in the region of the two dorsal punctures that are no more opaque than the surrounding surface; mentum tooth broadly truncate at apex; pronotum about seven-tenths as long as wide, the apex about nine-tenths as wide as the base, the base about five-sixths as wide as the pronotum at its widest part, the mid-lateral margins and hind angles each with a setiferous puncture, the side margins narrowly reflexed, the hind angles obtuse, tuberculate, bistriate, the transverse basal impression distinct; elytra with the striae nearly regular and finely punctate, the third and fourth intervals with a common vague impression at about the basal eighth, the third interval with two dorsal punctures well separated from either stria; length 5.75 mm.

Type: Finlay Forks, B. C. 22/6 130. Coll. R. Graham.

Distinguished from other American species by the subgenus *Chrysobracteon* by its uniformly alutaceous elytra without smooth spaces. From *pugetanum* Fall it is in addition distinguished by its truncate mentum tooth and from *punctatostriatum* Say by the fact that the pronotum is narrower at the base than at the middle. Named for its collector, Dr. Roy Graham (1908–1939), paleobotanist and assistant geologist of British Columbia. Prof. G. J. Spencer of the University of British Columbia has generously permitted me to retain the type in my collection.

Bembidion (Notaphus) tencenti n. sp.

Dark rufous, shining, above not or very feebly alutaceous except at base of head, the elytra slightly paler, evanescently darker towards scutellum and apex, the legs evanescently paler; pronotum from seven-tenths to three-quarters as wide as the elytra, the base about five-sixths as wide as the apex, the side margins in front of the sharply rectangular hind angles somewhat briefly subparallel and then sinuate, the basal impressions deep and foveiform, the carina at the hind angle short, the apical and basal transverse impressions distinct, the former feebly and the latter somewhat more strongly rugose; elytra with distinctly punctate impressed striae, the punctures becoming finer and nearly obsolete towards extreme apex, the third interval with two dorsal punctures; length 3.5–3.75 mm.

Type and two paratypes: Tencent L. [Harney Co.], Ore. V-25-

1950; collected by Kenneth M. Fender, the two paratypes in his collection.

This species most closely resembles *aberti* Hatch (Pan-Pac. Ent. XXVI, 1950, p. 102) from which it is distinguished by its smaller size and somewhat narrower pronotum, the base of which is narrower than the apex. From certain other species in the subgenus *Notaphus* like *timidum* LeC. in which the base of the pronotum is narrower than the apex, *tencenti* is distinguished by its rufous color, the elytra without distinct maculation.

Pterostichus (Hypherpes) setosus n. sp.

Black, shining; above alutaceous, the elytra somewhat more conspicuously so; pronotum with apex nearly as wide as the base, the sides entire, briefly subparallel and then sinuate before the slightly obtuse hind angles, the apical and basal transverse impressions feeble, a finely incised median line extending from in front of the apical transverse impression to behind the basal transverse impression, the inner basal impression well developed and linear, the outer basal impression subfoveiform, the surface between the two convex; elytral humeri not dentate, the striae deep and impunctate, the intervals somewhat convex, the extreme apices beyond the apical lateral sinuation more or less evenly arcuate; prosternum not margined at tip; protarsi with segments one to three dilated in male, narrow in female; metafemora arcuate along posterior margin in both sexes; abdomen with last sternite with two anal setae on either side along the posterior margin in both sexes; male with aedeagus produced in a subparallel lobe, the apex of the lobe very slightly wider and broadly slightly asymmetrically arcuate; length 11.5–13.5 mm.

Type male, allotype female, and 22 (9 males, 13 females) paratypes: Wrangle Gap, Rogue R. N. F., Ore. VII-12-1950; collected by Kenneth M. Fender, in whose collection are 15 (6 males, 9 females) of the paratypes.

Distinguished from all other Northwestern species of the subgenus *Hypherpes* by the two anal setae on either side along its posterior margin in both sexes (the other species have only one such seta on either side in the male). One of the paratype males has two anal setae on one side and one on the other. *Setosus* most closely resembles *brunneus* Dej., from which it is distinguished by the anal setae, the non-dentate elytral humeri, and the slightly bulbous extreme apex of the aedeagus.

Anilloferonia rothi n. sp.

Testaceous; parallel; eyes wanting; pronotum somewhat flattened, impunctate, about nine-tenths as long as broad, the base about nine-tenths as wide as the apex which is about five-sixths as wide as the pronotum at its widest, the sides feebly arcuate in front, slightly sinuate in front of the narrowly arcuate rounded hind angles, the anterior angles prominent, the sides with a single setiferous puncture in front of the middle and one towards the hind angles, the basal impressions single linear and impunctate, the hind angles flattened, the anterior and posterior transverse impressions distinct, the median line extending from the anterior transverse impression nearly to the base; elytra with nine impressed and very finely and not closely punctate striae, scutellar stria and basal and dorsal punctures absent, the marginal stria with very widely separated apical and basal series each of about six setiferous punctures, the humeri strongly dentate, the apex of each elytron separately rounded and feebly sinuate before the minutely rectangular sutural angle; hind wings apparently absent; pro- and mesothorax below with side pieces punctate anteriorly; the sidepieces of the metathorax and the abdomen impunctate; female with protarsi narrow, the last abdominal sternite with two setiferous punctures on either side along the posterior margin; length 8.25 mm.

Types female: Mary's Peak, Benton Co., Ore.; Aug. 21, 1949; V. Roth. I take pleasure in naming this remarkable species after its collector, Mr. Vincent Roth, at present a graduate student in entomology at the Oregon State College, who intends to give the type to the California Academy of Sciences.

Distinguished from previously known species of Anilloferonia by its larger size and its more depressed impunctate pronotum, the apex wider than the base, the anterior transverse impression distinct. The two previously known species of the genus are 5 to 6 mm. long with the pronotum more convex, punctate towards the hind angles, its base slightly wider than its apex, and its anterior transverse impression evanescent.

Agonum (Tanystola) charactum n. sp.

Black or rufo-piceous, the outer segments of the antennae of black individuals slightly piceous; shining, the head and pronotum finely, the elytra more strongly alutaceous; head impunctate; pronotum subquadrate, more than three-fourths as long as wide, the apex nearly three-fourths as wide as the base, the base about nine-

tenths as wide as the pronotum at its widest, the side margins notched in front of the bluntly rounded hind angles and thence nearly oblique or evanescently sinuate, the hind angles evidently lobed, the lobes extending posterior to the median portion of the basal margin, the surface impunctate except for a few coarse indistinct punctures in the marginal sulcus towards the hind angles, the side margins reflexed throughout, more broadly so towards the hind angles, the median line abbreviated at either end; elytra with nine entire impunctate striae, the scutellar stria missing, the intervals feebly convex, the second stria with a single setiferous puncture at its base, the third interval with three to five setiferous punctures, the apex with one or two setiferous punctures on the seventh stria, ninth interval with 15 or 16 setiferous punctures, the apical sinus evident; ventral surface impunctate; metepisternum short, the anterior margin about as long as the lateral margin; male with the first three protarsal segments feebly widened and spongy pubescent beneath, unmodified in female; male with the last abdominal sternite with a single setiferous puncture on either side along the posterior margin, the female with two such punctures on either side; length 9.5–10.5 mm.

Type male: Marshfield [now Coos Bay], Coos Co., Ore. 10. VIII '41 [collected by Borys Malkin]; allotype female: Eugene; Oregon. X 1941. B. Malkin (in Calif. Acad. of Sciences); paratype male: nest under stone, Silverton, Ore. 9 Apr. 1919. A. C. Burrill, Coll. The type and paratype have been very generously given to me by Mr. M. C. Lane.

Subgenus Tanystola Mots.

This subgenus is characterized by the hind angles of the pronotum, which is lobed and extend posterior to the median portion of its hind margin. This character distinguishes it from the other western subgenera known to me, except *Rhadine* LeC., in which group the elytral humeri are obsolete. The three known species are distinguished in the following key. I am indebted to Mr. Hugh B. Leech of the California Academy of Sciences for the loan of examples of *sulcatum* Dej. and *striatum* Dej. from the Van Dyke Collection at the Academy.

Key to Species of the Subgenus Tanystola Mots. of the Genus Agonum Bon.

1. Pronotum less narrowed behind, the base about nine-tenths as wide as the pronotum at its widest, the side margin oblique in front of the somewhat more strongly lobed hind angles. . 2

Pronotum more narrowed behind, the base about five-sixths as wide as the pronotum at its widest, the sides broadly nearly evenly arcuate from the almost evanescent rounded hind angles, which are somewhat more feebly lobed, the surface toward the side margins rather strongly reflexed, more widely reflexed towards the hind angles; 9.25–9.5 mm.; California (San Diego to Trinity Co.) .... *striatum* Dej.

2. Pronotum with side margins in front of the rounded hind angles entire or evanescently sinuate, the surface towards the side margins somewhat less strongly and widely reflexed than in *charactum,* the side margins somewhat more widely reflexed towards the hind angles; length 9.5 mm.; California (Humboldt Co.) .... *sulcatum* Dej.

Pronotum with the side margins of the somewhat more bluntly rounded hind angles notched, the surface towards the side margins somewhat more strongly reflexed, more widely reflexed towards the hind angles; length 9.5–10.5 mm.; Western Oregon (Coos Bay, Eugene, Silverton) .. *charactum* Hatch

Rembus oregona n. sp.

Black, impunctate, feebly shining, alutaceous, the head more feebly, the elytra more strongly so, the tarsi feebly piscescent; pronotum about two-thirds as long as wide, the apex three-fourths to four-fifths as wide as the base, the sides feebly sinuate and then arcuate in front of the sharp slightly obtuse hind angles, the basal impressions linear and smooth, the surface between the impression and the side margin explanate; elytra with eight finely sharply incised nearly impuctate striae, the scutellar stria fine and of variable length, the juncture of the sutural and second elytral stria with a setiferous puncture, the intervals nearly flat, the third interval without dorsal punctures; male with the first three protarsal segments dilated and spongy pubescent beneath, the last abdominal sternite with a single setiferous puncture on either side along the posterior margin; female with the protarsi unmodified, the last abdominal sternite with two setiferous punctures on either side along the posterior margin; length 11–12 mm.

Type male, allotype female, and six paratypes: McMinnville, Ore. V-17-1942, K. and D. M. Fender; five of the paratypes in the collection of the collectors. Distinguished from other Nearctic species of the genus by its length, the nearly rectangular hind angles of the pronotum, the entire impunctate elytral striae, the intervals nearly flat, the third interval without dorsal puncture.

Bradycellus (Triliarthrus) fenderi n. sp.

Black, strongly shining; appendages testaceous; anterior portions of head and narrow margins of pronotum and elytra, especially the sutural margin, very obscurely rufous; head with the frontal foveae linear and oblique, virtually attaining the eyes; antennae with dense pubescence beginning on the apical portion of the third segment, the extreme apical portion of the second segment evidently setulose; mentum acutely dentate; pronotum about two-thirds as long as wide, the apex and base about equal to width, the side margins arcuate and finely evenly reflexed, the hind angles broadly rounded, the basal foveae impressed and coarsely punctate, the basal margin beaded only towards the sides; elytra with striae impressed, entire, impunctate, the third interval with a single dorsal puncture behind the middle near the second stria, sutural stria present, the juncture of the sutural and second stria with an ocellate puncture, apical margin obliquely sinuate, the sutural angles acute and narrowly rounded; protarsal segments narrow, bisquamose beneath; mesotarsal segments not evidently modified; length 4.5 mm.

Type: Depoe Bay, Ore. V-14-41, probably a male, the type generously presented to me by Mr. Kenneth M. Fender. Distinguished from other species of the *badiipennis*-group of Casey (Mem. Col. V, 1915, pp. 238–240) by its smaller size, more nearly concolorous black dorsal surface with the margins more obscurely paler, and very different geographical range, the previously known species occurring in eastern North America.

Family Dytiscidae

Hygrotus (Coelambus) bonnelli n. sp.

Elongate oval, nearly twice as long as broad, the outline of the head, pronotum, and elytra not continuous; head nearly black, with a trilobed rufous spot on the vertex; pronotum dark rufopiceous, the extreme lateral margins nebulously rufous, the disc obscurely paler; elytra flavous, the posterior two-thirds or more with a pale rufous irregular cloud; venter black, the legs dark rufous; clypeus not margined; upper surface finely regularly punctate, the elytra slightly more coarsely so, the sutural and two discal series of larger punctures distinct and regular especially in front of the middle, the surface between the elytral punctures shining in the male, finely alutaceous in the female; sides of metasternum, metacoxal plates, and first entire abdominal sternite coarsely densely punctate, shining; male protarsi distinctly dilated, the anterior protarsal claw not perceptibly modified; length 4 mm.

Type male and allotype female: Abert L., Ore. June 16, 1938, Dan Bonnell. I take pleasure in naming this species after its collector, Dr. Daniel E. Bonnell, of Los Angeles, Cal. Apparently most closely related to *sharpi* Vd. Br., from which and from most of our other smaller non-vittate species it is distinguished by its pale flavate elytra. In this latter respect it resembles some of the larger vittate species of the genus, and like them occurs in an alkaline lake.

Hydroporus (Heterosternus) malkini n. sp.

Elongate oval, about 52% as wide as long; above shining, alutaceous, finely punctate, the head somewhat more finely and the pronotum somewhat more densely punctate; head above dark rufous, somewhat paler along the anterior margin; pronotum black, the lateral margins diffusely rufous, the marginal head narrow, a half or less as wide as the space between the anterior margin and the submarginal series of punctures; elytra with median portions and the suture throughout piceous brown, with about the basal and apical fourths and the epipleurae conspicuously testaceous; appendages rufous; ventral surface black, the head and lateral portions of the prothorax rufous; metasternum and abdominal sternites shining, alutaceous, distinctly punctate, more finely so behind; length 3.3–3.4 mm.

Type and ten paratypes: Pistol River, Curry Co., Ore. 10. IX. 1950. B. Malkin: type and two paratypes in the California Academy of Sciences, three paratypes in collection of author, one paratype in the British Museum of Natural History, one paratype in the collection of Kenneth M. Fender, one paratype in the Chicago Natural History Museum, and two paratypes in the collection of the collector, to whom I am indebted for permission to describe the species and after whom I take pleasure in naming it.

This species runs to *palliatus* Horn in Fall's key (Rev. N. A. Species of Hydroporus, 1923, p. 55) from which it is distinguished by the more extensive and more distinct elytral maculation, the basal pale band being wider, the apical spot more distinct and more constant.

Hydroporus subgenus *Oreodytes* Seidl.

The following corrections should be made in the key by me in the Bulletin of the Brooklyn Entomological Society XXVIII, 1933, pp. 23–25. The width of *angustior* Hatch is 1.65 mm., not 1.15 mm. The length of *hortense* Hatch is 4.5 mm., not 5.5 mm. The distribution of *semiclarus* Fall. is Colo. and Y.T., not Calif. and Y.T.

Rantus aequalis n. sp.

Above testaceous; head black behind except for a transverse bi-lobed spot between the eyes that is confluent with the pale anterior portion; pronotum with a black discal spot on either side of the middle; elytra irrorate with black, pale along sides and more narrowly so along base and suture; ventral surface black, the prosternum, appendages, and lateral spots on the abdomen pale; upper surface irregularly impressed with fine sinuate lines; elytra with a series of larger punctures along the suture and two discal series of smaller punctures; male protarsal claws equal, arcuate, sinuate along concave surface, a little more than half as long as the last protarsal segment; male posterior mesotarsal claw about three-fifths length of outer; male outer (anterior) metatarsal claw about one-fourth the length of the inner; length 10.5 mm.

Type male: Seattle, Wash. 4-22-24. Distinguished from *binotatus* Harr. by the shorter equal male protarsal claws. In *binotatus,* the anterior claw is longer than the posterior and nearly nine-tenths as long as the last protarsal segment.

Family Gyrinidae

Gyrinus (s. str.) **microtuberculatus** n. sp.

Shining black, the elytral punctures and lateral portions of the elytra aeneous, the ventral surface more or less rufous, somewhat rufopiceous towards the middle; pronotum with the transverse impressed lines of punctures in either anterior angle more distant from the anterior margin at their middle than at either end; elytra throughout microtuberculate, not alutaceous, the microtuberculations replacing the micropunctation of other species, the apex not plicate, the series of punctures unimpressed, the punctures of the inner series finer than those of the outer, the eleventh series nearer to the margin than to the tenth series; length 5.7 mm. (5 mm. to apex of elytra).

Type male: E. Was[hington]. Distinguished from other species of the genus by the microtuberculation of the elytra. It is, perhaps, most closely related to *confinis* LeC.

THE IMMATURE STAGES OF MITOURA HESSELI RAWSON & ZIEGLER (LEPIDOPTERA, LYCAENIDAE).

By G. W. Rawson, J. B. Ziegler, Summit, N. J. and S. A. Hessel, Woodmere, N. Y.

The discovery of *Mitoura hesseli* in the White Cedar Bog at Lakehurst, N. J. was recently announced (1). Since it was a matter of interest to work out the life history of this butterfly and thereby gain additional evidence with regard to its affinity to its congener, *M. gryneus* Hübner (= *damon* Cramer), we resolved to make the attempt at the earliest possible opportunity. Accordingly, we spent a week in southern New Jersey in late April and early May 1950 with this as our main objective. Unfortunately, a spell of cold and wet weather very nearly ruined our plans, but we were successful in capturing a single specimen of each species in the same old orchard, *M. gryneus* on Red Cedar trees which had been permitted to invade the area and *M. hesseli* on apple blossoms. White Cedar was not growing immediately at hand but a stand was known to be no more than a half mile distant. This sympatric relationship had not previously been observed. On a trip to Lakehurst late in the second week of May we were able to collect enough material to carry the project to a successful conclusion. According to plan we also obtained eggs of *M. gryneus* and bred this species through to the imago, being thus enabled to make a simultaneous, side-by-side comparison of the two species at each stage. *M. gryneus* was reared on Red Cedar, *Juniperus virginiana* L. while *M. hesseli* was reared on White Cedar, *Chamaecyparis thyoides* (L) (BSP).

In the following description of the immature stages of the two species we discuss gross features observable for the most part by the unaided eye or under low magnification, and also certain microscopic structural details of the mature larvae and pupae.

The early stages of *M. gryneus* have been described by Samuel H. Scudder (2), among others. We can in general confirm Scudder's observations although we cannot improve upon the elegance of his description.

Descriptions of Immature Stages

Egg.

In *M. hesseli* this is echinoid, as are many Lycaenid eggs, and is depressed in the region of the micropyle (Fig. 1). The surface is

covered with an irregular network of ridges with low bosses at the intersections; some of the cells so formed have a central, raised prominence which is not very conspicuous. When newly laid the color is dark green, about the same as that of the Cedar, but after about five minutes the color fades to a light green, noticeably lighter than that of the Cedar. Just before hatching it becomes yellowish-white. Dimensions: approximately 0.40 mm. high × 0.69 mm. broad.

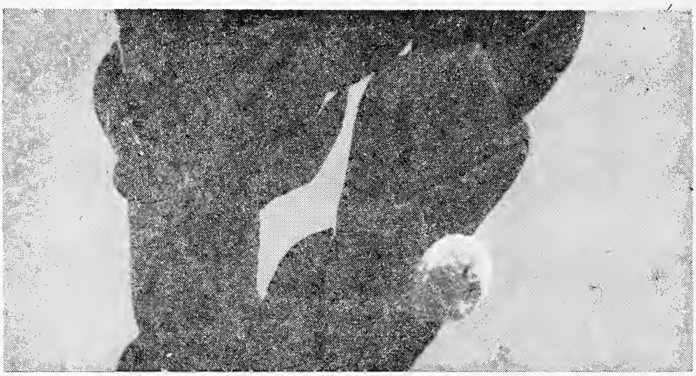


FIG. 1. Egg of *Mitoura hesseli* (16×).

In contrast, the egg of *M. gryneus* is somewhat smaller (Scudder gives 0.32 mm. high × 0.62 mm. broad). The style of reticulation differs rather widely from that of *M. hesseli;* the ridges are more prominent and their intersections are marked by more conspicuous bosses. Generally speaking, it presents a much more rugged appearance than that of *M. hesseli;* it rather strongly resembles an automobile "knobby-tread" or snow tire and is similar to the egg of *M. siva juniperaria* Comstock as figured by Dr. J. A. Comstock (3).

Larva.

First Instar. The ground color of the newly-hatched larva is pale yellow, sometimes a bit reddish. It is clothed with long, yellowish-brown hairs. The head is light brown and the ocelli are black. There are no markings with the exception of a dark spot near the anal extremity of the dorsum. The length is about 1 mm. directly after hatching.

At this stage the larva of *M. gryneus* is very similar in appearance.

Second Instar. The larva is larger and, viewed dorsally, more

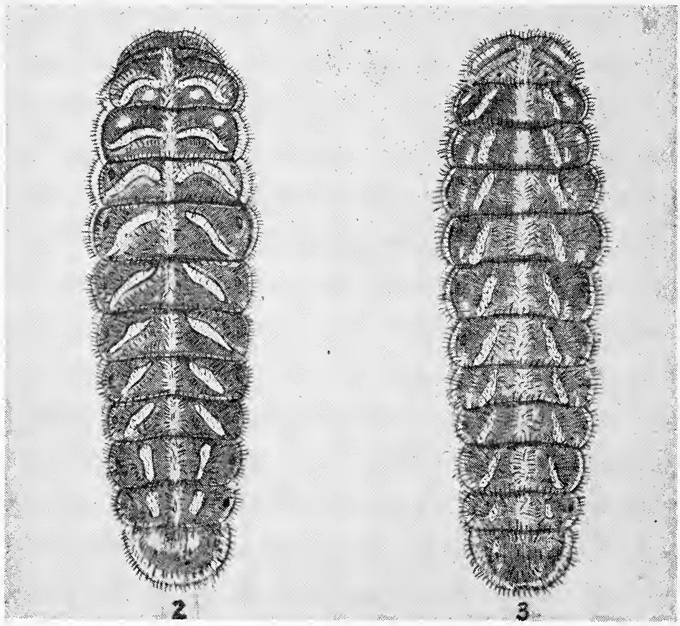
oval in shape. The body is still clothed with hairs, but these are no longer as prominent a feature. The ground color is a pale green, tending toward brownish-green in some specimens, and there are present a dorsal stripe of bluish-green and a sub-dorsal stripe of a reddish tint. The dark, dorsal, anal spot present during the first instar is no longer in evidence. Just before the molt, the length is about 2.5 mm.

At this stage the *M. gryneus* larva is still quite similar, except that the dorsal and sub-dorsal stripes are somewhat broader and are reddish-brown.

Final Instar. The larva is deep bluish-green, matching very closely in color the White Cedar upon which it feeds. A hood is now very prominent, hiding the head completely when the insect is feeding but not when it is moving. There is a fine, rather indistinct dorsal line of a lighter green color, interrupted at the incisures and, more especially, midway in the segments by small spots of a darker green color. The most prominent markings are a series of subdorsal, lustrous white, lunate or boomerang-shaped marks. On the first two thoracic segments these almost converge on the dorsum, forming marks rather like cupid's-bows in shape. There is also a series of infrastigmatal, white stripes, one per segment, which are horizontal except for those on the thoracic segments, which incline at an angle of about 45 degrees. On the second thoracic segment there is a whitish spot beneath the curve of the dorsal marking. On the third thoracic segment there is a similar spot above the curve of the dorsal marking. The spiracles are prominently displayed. Viewed dorsally, the incisures between the segments are rather shallow. The body, especially the anterior portion, is rather sparsely clothed with short, deep brown hairs. There is a peculiar, hood-like structure, cleft vertically, at the anterior extremity. This bears two white dashes which, viewed from the front, resemble eyes. The diamond-shaped dorsal shield is brown and bears two dark ocellus-like spots. Just before pupation the dimensions are about 15×4.2 mm.

In contrast the mature *M. gryneus* larva, while also deep green in color, is of a somewhat more yellowish tint, the color of the two larvae tending to parallel the colors of the two food plants. The subdorsal markings are shorter and much straighter than in *M. hesseli,* being at most only sublunate in form, and are more nearly parallel to the axis of the body. The cupid's-bow configuration on the thoracic segments so characteristic of *M. hesseli* is entirely lacking. The hairy covering is more dense, particularly on the anterior portion.

Figures 2 and 3 are photographs of watercolor paintings of the mature larvae of *M. hesseli* and *M. gryneus*. These are somewhat diagrammatic in nature and are not represented as being entirely exact anatomically; they are intended to demonstrate the differences in marking between the two species.



2 3

Fig. 2. Mature larva of *M. hesseli*. Fig. 3. Mature larva of *M. gryneus*.

Pupa.

The pupa is short and compressed, having a "trussed-chicken" appearance; viewed dorsally the abdomen is considerably broader than the thorax. It is in general dark brown in color. The thorax has a yellowish-brown, ill-defined line along the ridged dorsum. The abdomen is of a somewhat lighter brown with a series of shallow, supralateral pits bordered dorsally by vague, yellowish spots. The spiracles are small, clear, yellow dots. There is a single, lateral, yellow dash on the anterior portion of the thorax. The pupa is entirely free and unattached in any manner to the surface upon which pupation takes place. It is approximately 9 mm. long × 4 mm. wide.

Little if any definite difference could be detected between *M.*

hesseli and *M. gryneus* pupae, except that the latter is rather lighter in color.

Herewith we present observations on the duration of various stages in the life cycle of *M. hesseli.* A period of 8–11 days was required for the incubation of the eggs. The duration of each larval instar was 4–5 days, with the exception of the last which was about 12 days. The duration of the larval stage was about 27–30 days. Unfortunately we are unable to state the exact number of larval instars but believe it to be five. Most of the pupae emerged after 8–14 days. The average duration of the period from egg to imago was about 48 days except for those individuals which over-wintered.

Table of Differences—Mitoura spp.

The following statement of microscopic differences in larvae and pupae is offered through the courtesy of Prof. C. L. Remington of Yale University with whom preserved material has been deposited. It must be emphasized that these comparisons are based upon the examination of a very limited number of individuals and for that reason they are subject to possible revision at such time when more specimens are available.

Larvae.

M. hesseli (one)	*M. gryneus* (one)
Body setae short (a series of 10 measured in sequence on the side of abdominal segment IV were: 0.16 mm., 0.15, 0.15, 0.15, 0.18, 0.16, 0.16, 0.14, 0.16, 0.16).	Body setae longer (10 measured in sequence on the side of abd. seg. IV were. 0.21 mm., 0.19, 0.26, 0.24, 0.22, 0.15, 0.26, 0.28, 0.25, 0.24).
Crochets in cephalad group or prolegs of abd. segs. III–V 16–19 in number; gap between cephalad and caudad groups pronounced.	Crochets in cephalad group on prolegs of abd. segs. III–V 11–15 in number; gap between cephalad and caudad groups obscure.
Spatulate lobe on each ventral proleg blackish distally.	Spatulate lobe on each ventral proleg clear, whitish distally.
20 cuticular circlets just caudad of middorsal glandular opening on abd. seg. VII.	27 cuticular circlets just caudad of mid-dorsal glandular opening on abd. seg. VII.
5 cuticular circlets just cephalad of thoracic spiracle.	1 cuticular circlet just cephalad of thoracic spiracle.

Pupae.

M. hesseli (one)	*M. gryneus* (two)	*M. siva juniperaria* (three)
Setae rather long; most around 0.20 mm., some up to 0.27 mm. on profile of dorsum of end of abdomen.	Setae rather long; most around 0.20 mm.; some up to 0.30 mm. on profile of dorsum of end of abdomen.	Setae shorter; most around 0.13 mm.; some up to 0.22 mm. on profile of dorsum of end of abdomen.
Color chestnut-brown, markings very dark, rather distinct.	Color pale yellow-brown, markings rather faint.	(Color not examined).

General Notes on Biology of M. hesseli.

In several instances the act of oviposition was observed. The female usually took up her position head up on a twig of White Cedar and curved the tip of the abdomen as far as possible around the twig before depositing the egg. The eggs were usually laid near the fresh, light green growth at the tip of the twig.

On hatching the young larvae ate a generous portion of the egg shell in the micropylar region but in general most of the shell was left untouched. The first stage larvae spun silken threads and were able to hang suspended when dislodged from their resting places.

The young larvae fed exclusively on the new, light green growth at the tip of the twig, where they were quite inconspicuous objects. In general, they appeared to prefer the new growth through the third stage; thereafter they readily ate the older, dark green growth. The feeding larvae placed themselves along the twig with the anterior portion of the body curved over the tip. The head was completely concealed from view by the hood-like structure mentioned earlier. They lifted the tip of the abdomen up and away from the twig during defecation.

When ready to molt, the larva took up a position near the tip of a twig and remained motionless for about two days during which time its body shortened and became stouter. The skin then split just behind the anterior extremity; the larva crawled out; the cephalic capsule was cast off, and the larva then turned around and devoured the exuvium.

Based upon the observation of one specimen, the sequence of events just prior to pupation was as follows. On the evening of

June 20, the larva had apparently ceased to feed and had begun to change color, becoming generally darker with the sub-dorsal and infrastigmatal dashes changing from yellowish-green to reddish-brown in color. It was very active, circling round and round the bottom of the breeding cage. On the morning of June 21 it had become immobile. The markings had almost completely faded out and the color had become still darker. The body was noticeably shorter. When observed about ten hours later it was still motionless; the body was shorter and humped, taking on a distinct chrysalis-like shape, with the abdominal section broader than the thoracic section, viewed dorsally. At 6:00 P.M. on the evening of June 23 the abdominal region had changed in color still more; it was largely a dull yellowish-tan with a greenish tint. The thoracic section was somewhat greener. The skin, which up to this time was a rather fresh, translucent green around the periphery, had become a dull whitish-yellow, quite "dead" in appearance. The body was rather more elongated, having receded somewhat from the earlier pupal appearance. When it was examined again at 10:00 P.M., pupation had occurred. The cast larval skin was still attached to the anal tip. The pupa was completely free and unattached in any manner.

The following description of the emergence of the imago is based upon the observation of one specimen. Within a few minutes after rupture of the pupal shell (it had been observed intact just shortly before) the insect, dragging its soft wings which had already expanded almost two-thirds distad, was seen struggling to reach a suitable foothold from which free suspension would permit proper drying of the wings. A satisfactory position was very soon attained, the insect hanging from a bit of food plant, its body almost vertical but inclined very slightly backward. The costal margins of the primaries were barely visible above those of the secondaries. The progress of the stiffening of the costal wing margins was readily discernible, that of the primaries leading. The soft portions of the wings which had been curved outwardly as viewed from above assumed a single plane with the progression of rigidity. From the breaking of the pupal skin to full expansion consumed only about five minutes. It was not until almost the completion of development that there was any trace whatsoever of green on the undersides of the wings. The brilliant greenish color then began to creep over the wings in a manner suggestive of a photograph "coming up" in the developer. This progress was not uniform over the surface of the wing (only the secondaries are visible)

but proceeded from the perimeter inwardly. After about two more minutes no further change was perceptible.

Our captive females oviposited over a period extending from about May 15 to June 7, depositing up to a maximum of 90 eggs each. With two exceptions the imagos emerged from July 1 to July 20. Of a total of 96 pupae 42 (44%) produced summer brood adults, the remainder apparently holding over until the following spring. This experimental indication that *M. hesseli* is only partially double-brooded, at least in New Jersey, is supported by field evidence. In 1949 we found the spring brood much more numerous than the summer brood. In 1950 the spring brood was about as common as in the previous year, but the summer brood appeared to be almost totally absent, in spite of intensive search by us and by a number of other collectors. *M. gryneus* is also reported (4) to be partially double-brooded. However, each of 14 *M. gryneus* chrysalids (derived from spring brood females) reared by us yielded summer brood imagos. Furthermore, Mr. Otto Buchholz informs us that he at times has found the second brood of *M. gryneus* as common as the first brood, if not more so. It may be, therefore, that the partial character of the second brood is more pronounced in *M. hesseli* than in *M. gryneus,* at least in this region. Farther to the south *M. hesseli* may be completely double-brooded.

Acknowledgments

We are glad to record our indebtedness to a number of persons for their generous assistance in this study. Mr. C. F. dos Passos placed at our disposal valuable data from his rearing experience with *M. hesseli.* Professor Ivan M. Johnston of Harvard University determined the host plant of *M. hesseli.* Professor Charles L. Remington of Yale University turned over to us the results of his detailed microscopic study of certain of the early stages of *M. hesseli* and *M. gryneus.*

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A RELATION BETWEEN TEMPERATURE AND WING BEATS.

By Albro T. Gaul, Brooklyn, N. Y.

During the last few years, the author has been engaged in an effort toward the understanding of insect wing motion physiology. In this work, a number of experiments have been conducted on the relationship between wing frequencies and temperature. Since the literature abounds in confusing and contradictory statements in this matter, it is hoped that this paper may offer a satisfactory resolution of apparent experimental discrepancies.

Wing frequencies were determined by electronic instrumentation. The insects (mostly Vespine wasps) were persuaded to fly in front of a microphone. The microphone was fed into an amplifier of good quality, and the amplifier output was fed into an audio frequency meter, or an oscilloscope. Thus the frequencies were directly measured. As a check, the wing sounds were put into an electronic switch, whose other input was a differentiated sixty cycle wave. The output was then played into the vertical terminals of the oscilloscope, and the entire pattern was photographed; thus making absolute counting of frequencies easy.

Studies with *Vespula rufa* var. *consobrina* Sauss. and *V. maculifrons* Buy have indicated that wing frequency is independent of temperature changes over certain ranges. Frequency variations caused by fatigue, changes in air pressure, and other agencies, have been recognized and eliminated by the use of young, freshly fed, wasps, under similar barometric pressures, but under temperatures ranging from 8.5° C. to 28° C. Among both species, the wing frequency was stable and independent of these temperature changes. This author has shown that wing frequencies of wasps are quite constant for a given caste of a species, provided the individuals tested are fresh and without fatigue (2). This is at variance to the findings of Chadwick and Williams (1) who have found that the wing frequency of *Drosophila repleta* varies with temperature, sex, age, etc. On the other hand, the work of Von Buddenbrock (6) indicates that the wing beat of *Tipula* varies with load, but is constant over a range of temperatures.

This author has previously shown that there is a temperature threshold below which flight is impossible (3). It has been suggested by Dotterweich (4) and others that the flight muscles may be warmed by the accumulation of metabolic heat during activity.

The work of Sotavalta (5) shows that the wing frequency of *V. vulgaris* L. is nearly constant over the range of temperatures in which the insect flies; the frequency only decreasing at the extremes of heat and cold.

It is thus obvious that some insects can have a variable wing frequency, depending upon temperature; while other species have a wing frequency which is temperature independent. The author suggests the following simple explanation for this apparent disagreement of facts:

We can approach the activity within the insect thorax as a problem in thermodynamics. For simplicity, and in the absence of exact information, it is necessary to assume that the sclerotized thoracic plates of one insect will radiate heat energy at a rate equal to the rate of heat radiation by any other sclerotized plates. It is further necessary to postulate that a cubic millimeter of wing muscle, in action, will generate a constant quantity of heat, regardless of the species to which the wing muscle belongs. Since wing muscles comprise a major part of the thoraces of insects, the heat generated by flight activity should be proportional to the thorax size.

Allowing the presumptions of these special circumstances, let us analyze the problem as it appears in the thorax of *V. maculifrons* and *Drosophila melanogaster*. The thoraces of the two species are not dissimilar in their overall proportions, although the size is quite different.

Now if the rate of heat loss per unit surface area of thorax is proportional to the volume of musculature within the thorax (or the volume of the thorax itself, since this is an approximation), the equation: $V_1/A_1 = V_2/A_2$ should be true, where V_1 and V_2 are the volumes of the two thoraces being compared, while A_1 and A_2 are the respective areas.

The volumes of the actual thoraces were measured by displacement and computation with little difference in result. The areas were approximated by computation from photographs. It was found that the average of ten *Drosophila* (wild type) thoraces measured 2.36 $mm.^3$ in volume and 4.12 $mm.^2$ in area; the average of ten *Vespula* (worker) thoraces measured 85 $mm.^3$ and 93 $mm.^2$

According to the above equation, if heat generated is equal to heat radiated, then $2.36/4.12 = 85/93$. This is obviously incorrect upon inspection, and indicates a disproportion between heat generated and heat radiated among the two species. Substituting X for 93 and then solving the equation, we find that X = 148.3. This means

that in generating 2.36 calories, the *Drosophila* can radiate it through 4.12 $mm.^2$ at the rate of 0.57 $cal/mm.^2$ At the same rate of radiation, the *Vespula* thorax should have an area of 148.3 $mm.^2$ Since it has only 93 $mm.^2$ it must either retain its heat or have some mechanism to lose heat at a greater rate.

Returning, now, to our first assumption, we must recognize that the *Vespula* thorax is covered with much thicker and more heavily sclerotized plates than the *Drosophila* thorax. This added thickness would tend to decrease heat loss. The *Vespula* thorax is predominantly black, and can presumably radiate a little more than the brown of the *Drosophila* thorax, although this is probably not an important factor in changing the rates of radiation. We find no special means of eliminating excess heat in the case of *Vespula*; the thorax is of regular shape with no provisions to increase the cooling surfaces.

It is thus probable that *Drosophila* can lose its metabolic heat and be dependent upon temperature, while *Vespula* can retain some of its metabolic heat, and be somewhat independent of temperature.

It is thus shown that the thoracic volume/area ratio is certainly a factor in heat exchange in the active insect thorax; and that this ratio may in part, determine the dependence or independence of wing frequencies upon external temperatures.

Summary.

Various workers differ in their experimental results when correlating wing vibration frequency to temperature. It is possible that a study of thoracic volume and area may indicate whether metabolic heat is lost or retained; and that this relationship may partly determine relative dependence of a species upon outside temperature, for its flight frequency.

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Oviposition of *Pollenia rudis* (Fab.) the Cluster Fly (Diptera, Calliphoridae). The Cluster Fly has been observed ovipositing in the field by the author on many occasions. The females usually insert eggs into the soil surface in a rather indiscriminate manner, depositing 2 or 3 eggs within the radius of an inch or so and then flying a short distance away for further oviposition. Fairly loose soil seems to be preferred. Recently, however, the flies were observed ovipositing in a grassy area, a lawn, where the soil was compact. In this case the females inserted their ovipositors into the loose soil deposited by earthworms around their burrows. *Pollenia rudis* has been reported as having been reared from garbage, fecal matter, and from earthworms as hosts. This observation may be of interest in showing some ecological relationship between the fly and certain species of earthworms which act as hosts for the larvae.—R. M. DeCoursey, Storrs, Connecticut.

Corrodentia in Bee Hives: For several years small wingless Corrodentia have been observed to be present in hives occupied by honey bees throughout Utah. These were found between bottom-board and hive-body, all around between hive and super, between the supers, and where supers joined the top of the hive. Dr. Kathryn Sommerman examined specimens from hives and reported that the Corrodentia were of the genus *Liposcelis* sp.

A hive of bees resting on a wooden pollen trap at Farmington, Utah, became weakened by American foul brood during August of 1951. Bees in this hive were killed and the hive sealed for three weeks. Dead bees and chewed wax fragments from the bottom of the pollen trap, and a sample of old pollen in the bottom of the pollen tray, were found to be literally crawling with thousands of tiny Corrodentia. A large collection of these specimens was made. The tiny insects crawled all over and out of a modified Berlese funnel in the Entomology Department research laboratory at the Utah State Agricultural College. A moist camels-hair brush was useful in picking up the specimens.—George F. Knowlton, Logan, Utah.

A NOTE CONCERNING THE CORRECT APPLICATION OF THE GENERIC NAME *HELLUOMORPHA* CASTELNAU, 1834, AND PROPOSAL OF A NEW NAME. (COLEOPTERA: CARABIDAE: HELLUONINI).

By George E. Ball, Ithaca, New York.

The generic name *Helluomorpha* was proposed by Castelnau in 1834 (Etude Ent., I: 52) to include the following six species originally placed in *Helluo* Bonelli, 1813: *heros* Gory, 1833; *praeusta* Dejean, 1825; *clairvillei* Dejean, 1831; *laticornis* Dejean, 1831; *nigripennis* Dejean, 1831; and *pygmaeus* Dejean, 1831. In addition, *bellicosa,* a new species, was described and included in this genus. A genotype was not designated. This genus, with the same seven species, was listed by Castelnau in the "Histoire Naturelle des Insectes, Coleopteres," 1840, I: 47, but a genotype was not designated.

Heros Gory, 1833 was designated as genotype of *Helluomorpha* Castelnau by Duponchel in the D'Orbigny catalogue: "Le type de ce genre est l'*Helluo heros* Gory" (Dict. Univ. d'Hist. Nat., 1845, VI: 522).

Castelnau in 1852 (Encycl. d'Hist. Nat., Col., I: 92) designated *Helluo femorata* Dejean, 1831 as genotype of *Helluomorpha,* but this is invalid because first, *heros* Gory, 1833 had been selected as genotype seven years previously, therefore having priority, and second, *femorata* Dejean, 1831 had not been listed among the species originally included in this genus (see International Code of Zoological Nomenclature, Art. 30: II, e, alpha).

Chaudoir (Rev. et Mag. Zool., 1872, p. 213) recognized that *heros* Gory, 1833 was not a "helluonide," but was congeneric with *Herinnis chabrillaci* Thomson, 1857. Since *heros* Gory, 1833 is the genotype of *Helluomorpha,* this genus is synonymous with the zuphiine *Herinnis* Thomson, 1857, and its emendation *Erinnys* (Gemminger & Harold, Col. Cat., 1868, p. 100). However, inasmuch as *Helluomorpha* is twenty-three years older than *Herinnis,* it has priority. The following synonymy was proposed by Chaudoir in the article cited above: *bellicosa* Castelnau, 1834 = *heros* Gory, 1833; and *obscuricornis* Chevrolet, 1858 (Helluomorpha) = *chabrillaci* Thomson, 1857 = *macroptera* Chaudoir, 1850 (*Helluomorpha*). Therefore, the genus *Helluomorpha,* as now understood, includes only two species: *heros* (Gory, 1833) and *macroptera* (Chaudoir, 1850).

Since the name *Helluomorpha* is not available for use in its generally accepted sense (i.e. applying to the species originally included, with the exception of *heros, pygmaeus,* and *bellicosa*), it is necessary to either locate an available name, or propose a new one. I have been unable to find one in the literature, so I propose here the new genus *Helluomorphoides,* with *Helluomorpha texana* Le Conte, 1853 as genotype. All species listed under *Helluomorpha* Castelnau in the Coleopterorum Catalogus (1932–33, Csiki, III, Carabidae III: 1578–79) are included in *Helluomorphoides.*

BOOK NOTES

North with the Spring, by Edwin Way Teale. xviii + 358 pp., 32 pages of photographs. 6 × 9 ins., cloth bound. 1951. Dodd, Mead & Company, New York, N. Y. (Price, $5.00.)

Once again Edwin Way Teale's great artistry of exposition and unexcelled skill as a photographer are combined to give us another natural history masterpiece. This time 130 days of observation and 17,000 miles of travel have been blended with years of natural science experience to tell the story of the northward progression of the American spring. As the days increased in length the Teales moved northward recording in word and picture the changes which occur in the flora and fauna over a south-north expanse of over two thousand miles.

The story is divided into 34 short chapters dealing with such topics as Where Spring Begins, Spring in the Sky, Diamondbacks, Trillium Glen, Mountain Meadows, The Pine Barrens, Timberline and The Longest Day. Each chapter is filled with information that will be of interest to people in many varied fields of endeavor. Not only does the author provide vivid descriptions of what he saw but he also draws upon his vast knowledge of natural science to give a completeness and fullness to his story. His account of the perfumes of plants is a fine example of such integration but this is one among hundreds. Thus what could have been a mere travelogue becomes a source book of natural history.—George S. Tulloch, Merrick, N. Y.

CONTENTS

(Arranged alphabetically throughout)

Coleoptera

Diptera

General Subject

Heteroptera

Homoptera

Hymenoptera

Lepidoptera

Other Orders

BOOK NOTES.

Insect Natural History, by A. D. Imms. xviii + 317 pp., 106 color and 104 black and white photographs, 48 figs. 6 × 9 ins., cloth bound. 1951. Blakiston Company, New York, N. Y. (Price, $5.00.)

This is a book which has been written specifically to help amateur naturalists in their understanding of the general characteristics of insects. In simple language, unburdened by technical terms, the habits, physiology, structure, classification and economic importance of these animals are treated in an interesting manner. It is profusely illustrated by many excellent photographs and by simple drawings.

Among others there are chapters dealing with flight, sense organs, protective devices, social life, aquatic insects and biological control. A documentary appendix, distributional maps and an index are included. Although this book is for amateurs, its wealth of information should be helpful to the beginning student in entomology as well as teachers of elementary biology.—George S. Tulloch, Merrick, N. Y.

INDEX TO VOLUME XLVI

Arranged alphabetically throughout; valid species in Roman type, new species and other forms, **bold face.** ∅ indicates other animals; * plants.

Number of New Species and Other Forms in this Index, 41.

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FOR SALE—Die Gross–Schmetterlinge der Erde des Palaearktischen Faunengebietes. Prof. Dr. Adalbert Seitz, Stuttgart, 1915. 4 volumes of plates, 4 volumes of text. Fred T. Naumann, 17 Beekman Terrace, Summit, N. J.

WANTED—Proc. Ent. Soc. Phila., vols. 1–6; Proc. Calif. Acad. (Nat.) Sci., vols. 1–7; Psyche, vols. 11, 13, 15; Trans. Amer. Ent. Soc., vols. 1–5; Bull. Buff. Soc. Nat. Sci., vols. 2–3; Proc. Acad. Nat. Sci. Phila., vols. 1–8. C. F. dos Passos, Mendham, New Jersey.

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CONTENTS

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NEW GENERA AND SPECIES OF MUSCOID DIPTERA.[1]

By H. J. Reinhard, College Station, Texas

Most of the new forms described below are based upon Mexican material collected by Messrs. F. A. Cowan and M. R. Wheeler, to whom I am indebted for the privilege of studying the same. Types of the new species, except one as noted below, are in my collection.

Phasiostoma saxatilis n. sp.

A small, rather slender, gray fly like the genotype, *aristalis* Townsend, but with both haustellum and palpi considerably longer and the mesonotal pollen showing a median brown vitta. Other minor differences are listed below.

Male: Front at vertex 0.42 of head width, gradually widening forward; face narrowed from level of antennal base to near middle thence widening to lower extremity which equals vertex width; parafrontal, parafacial and cheek densely gray pollinose; frontal vitta usually dark brown but sometimes partly to wholly reddish, about equal to parafrontal width; frontal bristles rather weak, in a single row with two beneath antennal base; outer verticals short, inner pair long and erect; ocellars smallish, proclinate; two weak proclinate orbitals; antenna black, third segment about four times longer than second, apex broadly rounded posteriorly with upper tip subpointed; arista bare, almost equal the combined length of last two antennal segments, thickened to tip, first segment a little longer than broad, second very elongate and subequal to length of third; clypeus flush and transversely convex, epistoma strongly bowed forward from plane of latter; vibrissae weak, short, not decussate, on oral margin; facial ridges flat, with minute hairs

[1] Contribution No. 1512, from the Department of Entomology, Texas Agricultural Experiment Station.

ascending about to middle; proboscis moderately elongate, haustellum somewhat variable in length but usually approximating the head height, labella narrow and more or less elongated; palpus about three-fourths length of third antennal segment, variable in color ranging from yellow to deep brown or blackish; cheek barely one-third eye height, sparsely clothed with coarse black hairs; eye bare, not reaching to vibrissal level; back of head somewhat bulged below middle, densely gray pollinose and sparsely black-haired.

Thorax and scutellum black, with dense gray pollen showing a brownish tinge on median line of mesonotum. Chaetotaxy: acrostichal 0, 1; dorsocentral 2, 3; intraalar 3; supraalar 3; presutural 2; notopleural 2; humeral 2; postalar 2; pteropleural 0; sternopleural 4; scutellum with 2 lateral (hindmost weak), 1 good-sized subapical (with a pair of small hairs between latter) and 1 small discal pair; postnotal slope and propleuron bare; prosternum setose.

Wing subhyaline, rather broad but extending beyond tip of abdomen; first vein bare, third with one hair near base; first posterior cell narrowly open at extreme wing tip; hind cross vein perpendicular to fourth which it joins slightly nearer small cross vein than cubitulus; latter without stump or fold; epaulet infuscated; costal spine minute.

Legs long, weakly bristled; tarsi very slender, blackish, remaining segments usually concolorous but varying from partly reddish to wholly so; claws and pulvilli minute.

Abdomen rather narrow and longer than thorax, black, wholly gray pollinose with a dark median vitta more or less defined on intermediate segments above; first segment without, second with one pair of median marginals; last two segments each with a marginal row; no discals; genital forceps united, flat, unusually wide and thin in profile, apex broadly rounded at sides terminating in a minute median beak, the entire hind surface rather thickly clothed with short black hairs; accessory process reddish yellow, broad in profile and strongly bowed from base to rounded tip, latter directed inward; fifth sternite rather broadly and deeply incised, lobes blackish and moderately exposed apically.

Female: Abdomen somewhat shorter and broader above, genitalia retracted, not adapted for piercing; otherwise very similar to male.

Length: 4–6 mm.

Holotype male and allotype female, Rio Frio, Mexico, September 3, 1947 (F. A. Cowan and M. R. Wheeler) in the U. S. National Museum. Paratypes: 6 males and 30 females same data as type.

Cowania n. g.

Allied to *Meleterus* but the third antennal segment much more elongated; fifth vein bare, with last section distinctly less than one-half length of preceding; abdomen without discals, etc.

Head wider than high, facial profile strongly receding and distinctly longer than frontal, antennal axis slightly above eye middle and nearly twice length of oral margin axis; frontals in a single row, two beneath antennal base, the lowermost turned up; three proclinate orbitals, variable in size; outer verticals well developed, inner pair somewhat larger, straight; ocellars rather strong, proclinate; clypeus moderately depressed; short epistoma full width and nearly in plane of latter; vibrissae on oral margin, close to lower edge of head; facial ridges rounded or flattened, with a few bristly hairs on lower extremity; parafacial moderately wide on upper half, narrowed below, with three strong infraclinate bristles near middle interspersed with a few minute hairs; antenna subequal to length of face, third segment in male seven or eight and in female four times length of second segment; arista bare, thickened nearly to tip, second segment three or four times longer than wide; cheek bare, one-fourth eye height; proboscis short, labella large and fleshy; palpus longer than haustellum, moderately thickened apically; eye bare, not reaching to vibrissal level; back of head flattened, sparsely clothed with short pale hairs. Thoracic chaetotaxy: acrostichal 3, 3; dorsocentral 3, 3; intraalar 3; supraalar 3; presutural 2; notopleural 2; humeral 4; postalar 2; intrapostalar differentiated; pteropleural 1–3 (small); sternopleural 3; scutellum with 2 lateral (hindmost very strong and divergent), 1 large decussate apical, 1 suberect preapical and 1 small appressed discal pair situated well behind middle; postnotal slopes setose; propleuron and prosternum bare; infrascutellum normally developed. Abdomen narrower and considerably longer than thorax; intermediate segments without discals; first segment without, second with one pair of median marginals, third and fourth each with a marginal row, besides a submarginal row on latter. Wing extending slightly beyond tip of abdomen; first vein setulose on basal three-fifths and the third to well beyond small cross vein; first posterior cell narrowly open far before wing tip; hind cross vein in plane of apical, joining fourth about three-fifths the distance from small cross vein to cubitulus; latter with a short but distinct fold; costal spine small.

Genotype: *Cowania wheeleri* n. sp.

Cowania wheeleri n. sp.

Male: Front at vertex 0.38 of head width, hardly widening on

upper fourth thence diverging evenly into facial angle; parafrontal gray pollinose to vertex with a distinct pale golden tinge, sparsely beset with short black hairs; frontal vitta deep reddish, at middle about equal to parafrontal width; ocellar triangle rather large, extending almost to mid front, concolorous with parafrontal above; parafacial and cheek with heavy satiny white pollen on reddish ground color; antenna moderately slender, short basal segments reddish including narrow base of third which is noticeably swollen and convex on the front margin, immediately below the prominent base the segment is concave thence equibroad to a rounded apex, the black color is somewhat obscured by a dense uniform vestiture of white pubescence; palpus reddish yellow.

Thorax and scutellum black, rather densely gray pollinose, mesonotum with four dark vittae before the suture and five behind, all but the median one becoming indistinct posteriorly when viewed from behind.

Wing gray hyaline; veins including costa yellowish; epaulet and subepaulet black; calypter white.

Legs moderately long, black; hind tibia not ciliate; middle tibia with two strong bristles on outer front side before middle and a smaller one beyond; tarsi long and slender; claws and pulvilli as long as last tarsal segment.

Abdomen black, last three segments with rather dense gray pollen extending about to apical third, remainder of each moderately subshiny in most views; hairs on entire upper surface depressed; genital segments black; forceps united; rather slender in profile, gradually tapered to tip; accessory process shining brown, much broader and setiferously punctate on outer side; penis yellow with a rather slender basal segment, bearing a pair of forwardly curved subtranslucent lobes near middle on front side and a long coiled ribbon-like process at the apex; fifth sternite broadly and deeply incised, lobes shiny black basally but pollinose beyond middle.

Female: Vertex 0.36 of head width; two strong proclinate orbitals and a very weak one between same; outer vertical nearly as long as inner one; third antennal segment moderately slender, equibroad from base to apex; genitalia retracted within tip of abdomen, not adapted for piercing; claws and pulvilli short; otherwise similar to male.

Length: 7–8 mm.

Holotype male and allotype female, Fresnillo, Zac., Mexico, August 25, 1947. Paratypes: 3 males, same data as type and 2

males, Rodeo, Durango, Mexico, August 23, 1947. All collected by F. A. Cowan and M. R. Wheeler for whom the species is named.

Cyosoprocta n. g.

Similar to *Parachaeta* and *Thysanopsis,* but differing from both in having the parafacial haired below the frontals and the face more strongly divergent below. There are also distinctive differences in the genitalic structure.

Head wider than high, flattened behind, facial profile slightly concave, subequal the length of frontal, antennal axis on eye middle and about one-fourth longer than oral; broad clypeus moderately depressed; facial ridges strongly widened below, with four or five bristly hairs extending obliquely out and upward from vibrissae; latter considerably above oral margin; broad epistoma moderately elongate, bowed forward but not very prominent in profile; parafacial narrowed below to less than one-half clypeal width, bare on lower half; frontal rows doubled, the main row extending almost to middle of face; male without proclinate orbitals, female with two pairs; ocellars small, sometimes barely differentiated, proclinate; outer vertical vestigial in male; antenna moderately slender, reaching lower fourth of face, first segment slightly projected, second well over one-half (male) to two two-thirds (female) length of third; arista bare, basal segments short; eye bare, large, reaching about to vibrissal level; proboscis short and heavy, labella very large; palpus strongly compressed and bowed upward on apical half, as long as haustellum; cheek slightly exceeding one-fourth eye height; back of head thickly pale pilose. Thoracic chaetotaxy: acrostichal 3, 3; dorsocentral 3, 4; intraalar 3; supraalar 3; presutural 2; notopleural 2; humeral 3–4; sternopleural 4; pteropleural 4–5 (not longer than hindmost sternopleural); postalar 2; intrapostalar not differentiated; scutellum with 4 stout marginals and 1 weak depressed discal pair; propleuron and postnotal slope bare; prosternum setose. Wing large, extending well beyond tip of abdomen; third vein with 3 or 4 small hairs near base; first posterior cell open well before wing tip; hind cross vein oblique to fourth which it joins much nearer to cubitulus than small cross vein; last section of fifth vein short; costal spine vestigial. Legs moderately long and slender; hind tibia ciliated with a row of flattened closely set bristles on outer hind margin. Abdomen broad, short ovate, anal segment very short especially in female; basal segments without median marginals, third with a row of depressed marginals in males becoming weaker toward middle above but stouter and erect

in female; anal segment with dense, erect, bristly hairs over entire surface above; sternites covered.

Genotype: *Cyosoprocta funebris* n. sp.

Cyosoprocta funebris n. sp.

Male: Vertex 0.22 of head width, front widening rapidly from middle forward in facial angle; parafrontal blackish, with thin gray pollen extending to vertex; frontal vitta deep brown, slightly narrower than parafrontal on entire length; face including sides and cheek densely gray pollinose, the latter evenly clothed with fine black hairs; antenna wholly black; arista but slightly thickened basally and evenly tapered to middle, apical third slender; palpus black.

Thorax black, with dense vestiture of fine black hairs and moderately heavy gray pollen, which shows five narrow but distinct dark vittae before suture, only the median one continuous to scutellar base behind; scutellum deep red, subshiny, disk uniformly short-haired.

Wing gray hyaline, black basally, including the calypter.

Legs black; middle tibia with three anterodorsals; claws and pulvilli exceeding length of last tarsal segment.

Abdomen wholly opaque black above, venter silvery pollinose on inner margin of tergites one to four; genital segments black, rather small and retracted; forceps short, straight in profile, triangular as viewed from the rear, tips divided but not divergent; accessory process slender, fingerlike, as long as forceps; penis short, jointed near middle, apical segment widened to a vaselike tip fringed with a short reflexed pale membrane; fifth sternite broadly and deeply emarginate, the black lobes bearing long, coarse hairs on inner margin.

Female: Vertex 0.26 of head width, immediately diverging forward at a little less than facial angle; abdomen about as broad as long, fourth segment broad but very short, triangular as viewed from above; anal orifice slitlike, genitalia retracted; claws and pulvilli shorter than last tarsal segment.

Length: 10–12 mm.

Holotype male and allotype female, Rio Frio, Mex., Mexico, September 3, 1947 (F. A. Cowan and M. R. Wheeler). Paratypes: 5 males and 2 females, same data as type.

Cyosoprocta auriceps n. sp.

Similar to the preceding species except as follows:

Male: Head pollen wholly golden; second antennal segment

four-fifths length of third; scutellum blackish on basal margin; abdomen moderately subshiny above intermediate segments with silvery pollen, which in a favorable view extends over the basal half at sides and at middle above where it is broadly interrupted by a dark median vitta; anal segment wholly yellowish gray pollinose except at middle above; venter with extensive paler gray pollen; calypter smoky brown, the junction of front and hind lobe whitish. Female unknown.

Length: 11 mm.

Holotype male, Rio Frio, Mex., Mexico, September 3, 1947 (F. A. Cowan and M. R. Wheeler).

Leschenaultia hospita n. sp.

Similar to *leucophrys* Wiedemann, differing mainly in the male genitalia; also, in having the parafacial more extensively haired beneath the lowermost frontals. Other minor differences are listed below.

Male: Front equibroad on upper third, thence widening rapidly forward, at vertex 0.24 of head width; parafrontal blackish, with thin gray pollen and black hairs which become bristly anteriorly and extend well below the frontal row; frontal vitta deep red to brown, much narrower than parafrontal; ocellars long, proclinate; outer vertical vestigial; antenna black, third segment a little less than twice length of second; arista slightly thickened and evenly tapered to apical third, basal segments short; parafacial with heavy gray pollen, narrowed below to less than one-half clypeal width; facial ridge bristled to middle or a little above; palpus yellow, longer than short thick haustellum; cheek moderately gray pollinose on dark background, a little over one-fourth eye height; occipital pile white.

Thorax black, scutellum deep reddish; mesonotum moderately gray pollinose, with five vittae evident in front but less so behind suture; acrostichal 3, 3; dorsocentral 3, 4; sternopleural 3; scutellum with 4 lateral (second one from base often weak and the hindmost pair with two stout spines between them), 1 long depressed discal pair and numerous shorter erect spiny bristles becoming finer and hairlike toward basal margin.

Wing subhyaline, strongly infuscated to wholly black at extreme base; costal spine vestigial; first posterior cell open well before wing tip; third vein with two or three hairs near base; calypter and subepaulet black.

Legs moderately long and slender, black, tibiae obscurely reddish, hind pair ciliate, the flattened bristles closely set and uniform in length; middle tibia with a row of four or five anterodorsals; tarsi slender, claws and pulvilli elongate.

Abdomen black, sometimes reddish on sides, upper surface moderately shiny but with thin tawny pollen on last two segments visible in a flat rear view; first segment with about 10 median marginal spines, second with a complete marginal row and numerous shorter spiny discals on median third of segment; a discal and marginal row on third segment and the anal entirely bristled above except on narrow basal border; genital segments blackish, rather small; forceps in profile strongly bowed backward before apex, latter rounded and slightly swollen; accessory process closely appressed to lateral margin of forceps and a little shorter than latter; fifth sternite broadly and deeply excised, inner margin of each lobe bearing several long bristly hairs; venter beset with numerous spinelike bristles.

Female: Vertex 0.28 of head width, diverging immediately forward at facial angle; two proclinate orbitals; outer vertical differentiated; palpus usually more or less infuscated basally; abdomen largely black, more shiny, the discals on intermediate segments often considerably reduced in size and number; fore tarsi moderately broadened, claws and pulvilli shorter than last tarsal segment.

Length: 11-14 mm.

Holotype male and allotype female, Zamora, Mich., Mexico, August 27, 1947 (F. A. Cowan and M. R. Wheeler). Paratypes: 6 females, same data as type and 1 pair, Nochixtlan, Mexico, September 6, 1947 (Cowan and Wheeler).

Three females, apparently taken with the rest of the Zamora series, are larger and much more robust in build. They are provisionally included here but differ in having the facialia bristled on lower third, second abdominal segment slightly pollinose on basal edge above and the subepaulets are reddish to brown. Without corresponding males, it is impossible to decide whether these differences are specifically significant.

Saundersiops harpeza n. sp.

Male: Front at vertex 0.30 of head width, scarcely widening to middle, thence rapidly so into facial angle; parafrontal yellowish gray pollinose on dark background, sparsely black-haired; frontal row doubled anteriorly, two or three bristles beneath antennal base; verticals large, inner pair decussate and the outer divaricate;

ocellars normally absent, sometimes slightly differentiated; frontal vitta yellow, strongly narrowed toward vertex, at mid front about equal to parafrontal width; parafacial and cheek light golden pollinose on pale background, each with a vestiture of longish pale hairs; clypeus concolorous with parafacial; epistoma strongly projecting forward between vibrissae; latter slightly above oral margin; facial ridges with a few bristles on lower extremity; basal antennal segments red, third largely black, slightly longer than second; arista micro pubescent, second segment slightly elongate, the first barely longer than wide; palpus reduced to a minute stub or entirely absent but in either case palpal bristles are present; haustellum rather slender, well over one-half head height; cheek exceeding one-half eye height.

Thorax black, with moderately dense opaque yellowish gray pollen, scutellum reddish, more lightly dusted with whitish pollen; mesonotal vittae narrow and poorly defined; four post dorsocentrals; three sternopleurals; scutellum with two lateral, one hairlike apical besides stout marginal and discal spines; propleuron pilose; prosternum and postnotal slope bare.

Wing moderately smoky with base yellowish as far as stigma; veins yellow, third with three hairs near base; apical cell open far before wing tip; epaulet and subepaulet yellow; calypter variable, hind lobe usually wholly infuscated and the front one pale yellowish white but sometimes both lobes entirely blackish (especially in female) or with one or both of the dark lobes paler at middle.

Legs blackish basally, apex of femora, tibiae and tarsi yellow; latter black-haired; pulvilli and claws pale yellow, latter brown-tipped and as long as last tarsal segment.

Abdomen wholly shining above, black, broad sides of intermediate segments deep reddish; venter shining; sternites heavily spined; discal bristles on third segment above in two rows, the posterior row extending uninterruptedly to the lateral discals; first segment without median marginals, second with an incomplete marginal row; intermediate segments each with a segregated group of 8 to 12 pairs of spinelike discals; anal segment with a marginal row and irregularly spaced discals above except on narrow front border; genital segments small, shining black, second more or less reddish at sides; forceps fused, short, convex behind, tips separated by a small V-shaped incision; lobe of fifth sternite subacute apically with extreme tip bowed inward.

Female: Vertex 0.34 of head width; two proclinate orbitals; frontals in a single row; claws and pulvilli shorter than last tarsal

segment; anal orifice large, caudoventral, genitalia retracted, otherwise as in male.

Length: 9-11 mm.

Holotype male and allotype female, Rio Frio, Mex., Mexico, September 3, 1947 (F. A. Cowan and M. R. Wheeler). Paratypes: 2 males and 3 females, same data as type.

Charasoma n. g.

Similar to *Dexodes,* but readily distinguished in having the propleura setose.

Head one-seventh wider than high, facial profile moderately receding and as long as frontal, antennal axis at or a trifle below eye middle and about one-fourth longer than oral axis; clypeus moderately sunk, short epistoma about as wide as latter and in plane of same; vibrissa near oral margin; facial ridge setose on lower fourth or less; parafacial bare, equibroad, about two-fifths clypeal width; antenna four-fifths length of face, third segment about three times longer than second; arista longer than antenna, micro pubescent, thickened on basal fourth tapering to a very slender tip, basal segments short; frontals in a single row in both sexes, two to three bristles beneath antennal base; two proclinate orbitals in female, outer verticals vestigial in male; ocellars well developed, proclinate; eye bare, somewhat oblique, reaching almost to vibrissal level; cheek about one-third of eye height; palpus spatulate, longer than short haustellum; back of head flattened, rather thinly pilose. Thoracic chaetotaxy: dorsocentral 3, 3; acrostichal 3, 3 (hindmost presutural close to suture); intraalar 3; supraalar 3; presutural 2 (inner one small); notopleural 2; humeral 3; posthumeral 2; postalar 2; intrapostalar well differentiated; sternopleural 3; pteropleural 1 (small); scutellum with 1 weak discal, three lateral, apicals absent or reduced to minute hairs; prosternum setose; postnotal slope bare. Wing rather long and narrow; first posterior cell narrowly open shortly before extreme wing tip; hind cross vein oblique, joining fourth slightly nearer cubitulus than small cross vein; last section of fifth vein scarcely one-fourth length of preceding section; costal spine distinct but not very long; calypter moderately large. Legs long and slender especially in male, latter with claws and pulvilli strongly elongate; hind tibia not ciliate. Abdomen conical, longer than thorax in male; first and second segment with one pair of median marginals and last two each with a marginal row besides two discal rows on anal; normally one pair of discals on segments two and

three but sometimes doubled especially on third; sternites covered; female genitalia retracted, not adapted for piercing.

Genotype: *Charasoma subolis* n. sp.

Charasoma subolis n. sp.

Male: Front at vertex 0.23 of head width, somewhat narrowed forward thence widening rapidly in facial angle, head black in ground color, parafrontal, parafacial and cheek including posterior orbit cinereous pollinose; frontal stripe deep brownish black, wider than parafrontal on entire length; antenna and arista black; palpus reddish yellow becoming darker near base; haustellum very short, stout, labella fleshy; occiput thinly clothed with mostly pale hairs.

Thorax and scutellum black, rather thinly gray pollinose, with four vaguely defined dorsal vittae; infrascutellum pruinose, postnotum shining black.

Wing subhyaline; third vein with two or three hairs near base; cubitulus obtusely rounded, without stump or fold; epaulet black; calypter semitransparent white.

Legs black; mid tibia with one stoutish bristle on outer front side near middle; tarsi long and slender, somewhat compressed; claws brownish, longer than apical tarsal segment.

Abdomen black, last three segments with bluish gray pollen becoming thinner on apical third above, the hind margin of each appearing blacker and more or less subshiny in direct view; hairs on upper surface not very dense or long, erect along median line but less so on lateral margin; genital segments small and retracted, mostly shining black; forceps rather short and moderately thick in profile, united about to middle thence divided but not divergent, with a vestiture of short blackish hairs on hind side; accessory process slender and fingerlike, as long as forceps; fifth sternite broadly and deeply cleft, lobes shining black, beset with fine long hairs along inner margin.

Female: Vertex 0.28 of head width, front widening uniformly to antennal base; frontal stripe narrowed toward vertex and not wider than parafrontal; outer vertical well developed; claws and pulvilli short; abdomen somewhat arched and more pointed apically than in male.

Length: 5.5–8.5 mm.

Holotype male and allotype female, College Station, Texas, April 11 and 16, 1944–46 (H. J. Reinhard). Paratypes: 1 male, same data as allotype and 1 female, Farmingdale, L. I., New York, June 6, 1936 (Blanton and Borders).

Charasoma residis n. sp.

Female: Similar to the preceding species except as follows: cheek, posterior orbit, parafacial and parafrontal except near vertex silvery pollinose; third antennal segment three times length of second; vertex 0.29 of head width; thorax more densely gray pollinose with four rather well defined dark stripes before suture and five behind; two sternopleural bristles; abdomen moderately arched and narrowly truncate at tip; genitalia retracted; anal cerci short and approximated, beset with fine pale hairs dorsally. Male unknown.

Length: 7 mm.

Holotype female, Amherst, Ohio, July 12, 1934 (H. J. Reinhard). Paratype: 1 female, Ag. Coll. Mich., May 26, 1922 (L. G. Gentner).

Charasoma pammelas n. sp.

Differs from *subolis* mainly as follows:

Male: Darker and more shiny in general aspect; vertex wider, measuring 0.27 of head width, front scarcely narrowed forward before widening into facial angle; head pollen plumbeous; parafrontal moderately haired outside of frontal row, which extends three or four bristles below antennal base; palpus black, elongate; third antennal segment slightly over twice length of second; parafacial one-half or more clypeal width; occiput black and subshiny in some angles, but thinly gray pollinose with coarse black hairs above and finer pale ones below. Thorax and scutellum subshiny black, lightly dusted with pale gray pollen which appears denser and shows four indistinct mesonotal vittae in a flat rear view. Wing with a light brownish tinge becoming darker near base; calypter pale yellowish white. Abdomen moderately shining black, with basal half to three-fifths of last three segments gray pollinose; discals on intermediate segments long and erect, with somewhat smaller bristles interspaced along median line; anal segment rather strongly bristled above except on basal margin. Female unknown.

Length: 7.5 mm.

Holotype male, Forest Grove, Oregon, May 20, 1918 (F. R. Cole). Paratype: 1 male labeled "Oregon, June 16, 1931."

TWO NEW MICROVELIA WESTWOOD (HEMIPTERA: VELIIDAE).

By Carl J. Drake, Ames, Iowa.

The present paper contains the descriptions of two new species of *Microvelia* and notes on two other species from tropical Americas. The location of the types is given beneath the descriptions.

Microvelia longipes Uhler

Microvelia longipes Uhler, Proc. Zool. Soc. Lond., 1894, p. 219
Microvelia modesta Uhler, Proc. Zool. Soc. Lond., 1894, p. 220 (N. syn.)

An examination of the type material in Uhler's (U. S. Nat. Mus.) and Summer's collections (Drake Collection) from the Mount Gay Estate in Grenada, B.W.I., shows *M. modesta* to be composed entirely of long-winged females of *M. longipes* Uhler. As the latter has page priority, *M. modesta* must be suppressed as a synonym of *M. longipes.*

In addition to the specimens from Grenada, many specimens of *M. longipes* Uhler have been examined from numerous islands of the West Indies, Brasil, Colombia, Ecuador, Peru, Paraguay and Bolivia. Both macropterous and apterous males exhibit great variation in the length of the unusually long hind legs. The extremely long-legged males are the swiftest water-skaters of the American species of *Microvelia* Westwood. The legs of the females do not show very much variation in length, and are much shorter than in the male.

Microvelia mimula B.-White

Microvelia mimula Buchanan-White, Jr. Linn. Soc. Lond., Zool., 14: 487. 1879.
Microvelia myersi McKinstry, Jr. Kan. Ent. Soc., 10 (1): 32. 1937.
Microvelia capitata Uhler, Proc. Zool. Soc. Lond., 1894, p. 218.

An examination of Uhler's specimens of *M. capitata* from Grenada shows that he wrongly determined *M. mimula* B.-White as *M. capitata* Guerin. The small tubercle on the next to the last ventrite of the male as well as strikingly different male genitalia separate *M. mimula* at once from closely allied species. *M. mimula* is also very widely distributed in the West Indies and ranges south into Argentina and Peru. As pointed out elsewhere, *M. myersi* McKinstry is a synonym of *M. mimula* B.-White.

Microvelia minima n. sp.

Apterous form: Very short, moderately broad, ovate, blackish with a short, broad, transverse, orange-yellow band near front margin of pronotum; pubescence short, dark brown; last tergite usually bluish, body beneath bluish black; connexiva concolorous with tergites, without spots; legs dark brown or fuscous with bases of femora, coxae, trochanters and both femora and tibiae beneath testaceous.

Size: Length, 1.34 mm.; width, 0.75 mm.

Head: Width across eyes, 0.45 mm. Black with median line distinct; beneath black, with very deep rostral groove. Rostrum testaceous with terminal segment piceous. Antennae rather stout, shortly pilose with some longer bristles; formula—I, 12; II, 9; III, 11; IV, 22.

Thorax: Pronotum not very large, widely excavated behind, covering most of mesonotum; mesonotum very widely excavated behind, the exposed part short. Legs short, stout, the hind femora of male unarmed. First tarsal segment of both middle and hind legs about one-third as long as the second.

Abdomen: Length, 1.00 mm. Last tergite of male scarcely twice as long as the preceding segment, with a few brownish hairs. First genital segment of male beneath short, concavely excavated behind, on each side apically with a short longitudinal row of long bristly hairs (as segment is not fully exposed, structures not plainly visible). Female and winged forms of both sexes unknown.

Type (male) and 1 *paratype,* Rio Janeiro, Brazil, Nov. 11, 1938, Carl J. Drake. *Paratypes,* 2 specimens, Nova Teutonia, St. Catarina, Brazil, June 10, 1950, Fritz Plaumann.

Closely allied to the apterous form of *M. venustatis* Drake and Harris, but easily separated by its more ovate form and much longer last antennal segment, which is at least as long as the two preceding segments.

Microvelia oraria n. sp.

Apterous form: Small, dark brown with transverse frontal band of pronotum testaceous and place near anterior margin; tergites with more or less distinct bluish spots; connexiva above somewhat brownish, beneath brown; body beneath dark bluish. Legs dark brown to fuscous with coxae, trochanters and most of femora basally testaceous.

Size: Length, 1.35–1.60 mm.; width, 0.50–0.60 mm.

Head: Width across eyes, 0.40 mm. Fuscous brown with distinct median line. Rostrum testaceous with terminal segment dark. Antennae moderately stout, rather long, shortly pilose, dark brown with basal half of first segment testaceous; segment I stout, feebly bowed; II slenderer, slenderest at base, thence enlarged apically; III and IV slender, practically equal in thickness; formula—I, 13; II, 10; III, 14; IV, 28.

Thorax: Pronotum very large, covering all or practically all of the rest of thorax, feebly rounded behind with the lateral corners more rounded, two and one-half times as wide at widest part (behind middle) as median length (50 : 20). Legs rather short, moderately stout, all femora of nearly equal thickness, clothed with very short hairs; femora of male unarmed. First tarsal segment of both middle and hind legs nearly one-half as long as segment two.

Abdomen: Length, 0.90–1.00 mm. Nearly parallel-sided in male; connexiva wider in female and more convex, not reflexed; tergites more narrowed posteriorly in female than male. Last tergite and ventrite longer than preceding segment in both sexes.

Male: First genital segment above distinctly emarginate behind; beneath rather short, broadly impressed on median line, with a V-shaped excavation behind, the longitudinal impressed part clothed with pale bristly hairs, the hairs along the sides of impression longer, denser and pointing inwardly with their tips turned downward, thus forming nearly parallel brushes on each side of impression.

Type: (male) and *allotype* (female), Port Limon, Costa Rica, Sept. 30, 1905, taken in a crab burrow by Fred Knab, U. S. Nat. Museum. *Paratype,* 1 female, taken with type, in my collection.

The much smaller size and antennal formula separate this insect from *M. hidalgoi* McKinstry and *M. oaxacana* Drake.

NOTICE

A special sale of all overstock reprints of articles which have appeared in the new series of **Entomologica Americana** since 1926 is now in progress. A price list may be obtained from George S. Tulloch, 22 East Garfield Street, Merrick, N. Y.

COLIAS PALAENO CHIPPEWA KIRBY OR EDWARDS? (LEPIDOPTERA: PIERIDAE).

By Paddy Mc Henry, Burbank, California.

Modern writers on American Lepidoptera (W. J. Holland and J. H. Mc Dunnough) give W. F. Kirby as the author of the race *chippewa*. *Chippewa* is the substitute name for W. H. Edwards' pre-occupied name of *helena*. The literature apparently has been considered as follows:

1863. Edwards published the name, *Colias helena,* in "Proc. Ent. Soc. Phil." p. 80.
1868. Edwards republished the text and figured *helena* in "Butt. N. Amer., Series I, Part 2."
1871. Kirby published the name, *chippewa,* as "Edw. (in litt.)"; in "A Syn. Catal. of Diurn. Lep." p. 495.
1872. Edwards published the name, *chippewa,* in "Synopsis of North American Butterflies" p. 8.

The date of the "Synopsis etc." is considered to be 1872 as its title page bears this date; it is normally bound in the back of "Butt. N. Amer., Series I." After careful study of two copies of Series I in the original edition, I would like to point out that much of the "Synopsis etc." was published before 1872 in connection with the various parts of the "Butt. N. Amer., Series I." The tabulation below is made from a copy in the Los Angeles City Library and from one in my library. The Los Angeles City Library copy is bound in the same sequence as the parts were published. My own copy, while not complete, is in the original wrappers; some of the back wrappers have been removed along with some of the pages of the "Synopsis etc." which were printed with the parts. The pages of the "Synopsis etc." were not laid in but were printed as integral sections of the parts. The "Dates of Issue" below are taken from a supplemental page of "Butt. N. Amer., Series I."

"Butt. N. Amer.-Ser. I"		*"Synopsis etc." pages.*	
Part	*Date of Issue*	*My Copy*	*Library Copy*
3	Dec., 1868	[1] thru 4	[1] thru 4
4	April, 1869	5 & 6	5 & 6
5	Dec., 1869	5 & 6	5 & 6
6	June, 1870	7 thru 14	7 thru 14
7	Jan., 1871	15 thru 22	15 thru 22
8	Aug., 1871	?	23 thru 38

9	Dec., 1871	?	None
10	July, 1872	?	39 thru 52

As will be noted Part 6, June 1870, contains page 8 on which the name *chippewa* was first published by Edwards. Kirby's publication probably did not appear until after March, 1871 since the preface of his work is signed with this date.

Edwards' intention of publishing pages of the "Synopsis etc." along with the various parts of "Butt. N. Amer., Ser. I" is indicated in an "Advertisement" in this volume. That his intention had been carried out is indicated on page 51 in the "Synopsis etc."; here he also states that certain pages were revised; a check reveals that the revisions were made.

Apparently, in most cases, the binders in binding Series I rejected these early pages of the "Synopsis etc." and used a complete 1872 set. In the latter editions only an 1872 set was printed.

I believe that the above data will restore the authorship of the race *chippewa* to its true author, W. H. Edwards.

BOOK NOTES.

American Social Insects, by Charles D. & Mary H. Michener. xiv + 267 pp., 30 plates in color and 79 plates in gravure. 6 × 9 ins., cloth bound. 1951. D. Van Nostrand Company, New York, N. Y. (Price, $6.00.)

This is the latest addition to the New Illustrated Naturalist series which concerns itself with the behavior of the social insects found in America. It has been written for the layman naturalist and great care has been taken in the presentation to keep the use of technical terms well within the tolerance limits of a non-professional. Those terms which are introduced are defined in clear and simple language and are a tribute to the skill and understanding of the authors.

The subject matter is presented in 26 chapters assembled under six main topics. By way of orientation there is an introductory section on the nature of social insects which provides an excellent foundation for the later material. This is followed by discussions of hornets and other wasps, bees, ants and termites and the concluding section is a provocative account of societies and their parasites.

There long has been a need for a book of this type based on American social insects to fill a gap in our naturalist literature. Consequently, the appearance of such an excellent and absorbing treatise is most welcome.—George S. Tulloch, Merrick, N. Y.

Thripsaphis Notes: A few slides of these interesting little aphids collected in grass-sedge net sweepings, recently have been identified by Professor M. A. Palmer. Records of some of these are as follows:

Thripsaphis balli (Gillette). Taken at Logan, Utah, September 2, 1925; Red Rock Canyon, Utah, June 20, 1950; and Fish Haven, Idaho, May 21, 1949 (Knowlton).

T. producta Gill. Fairview, Utah, July 6, 1950 and near Salt Lake City, October 16, 1943 (Knowlton).

T. verrucosa Gill. Salt Lake City, Utah, October 16, 1943; Soldier Summit, Utah, September 16, 1943; and Franklin, Idaho, August 13, 1949 (Knowlton). G. F. Knowlton, Logan, Utah.

BOOK NOTES.

Parasitic Animals, by Geoffrey Lapage. xxi + 351 pp., 113 figs. 5 × 7 ins., cloth bound. 1951. Cambridge University Press. (Price, $4.00.)

In the author's words Parasitic Animals "is not in any sense a text book of economic parasitology. Its aim, on the contrary, is to give from the biological rather than the economic point of view, an outline of the general principles which govern the lives of parasitic animals". Thus we have in this book a discussion specifically centering around the fundamentals of parasitology.

The various chapters deal with the routes by which parasitic animals enter and leave their hosts, some representative life cycles, the effects of parasitism both on the parasite and the host and concludes with a consideration of certain specialized host-parasite relationships. Through the discussion each point is substantiated by references to specific parasites. The subject matter is presented in simple and concise form with a minimum of technical terms.

One cannot question the selection of topics since their broad nature permits the greatest latitude in interpretaion. Some may question certain of the statements regarding specific parasites while others will be disappointed that the results of recent investigations have not been incorporated in the illustrative material. All will agree, however, that in **Parasitic Animals** an excellent text of fundamental parasitology has made its appearance.—George S. Tulloch, Merrick, N. Y.

A NEW NORTHERN AEDES MOSQUITO, WITH NOTES ON ITS CLOSE ALLY, AEDES DIANTAEUS H., D., & K. (DIPTERA, CULICIDAE).[1]

By Marion E. Smith, Amherst, Mass.

In late April and early May of 1949, a number of larvae of a small *Aedes* mosquito were collected by the writer in a sphagnum bog in Belchertown, Mass. By means of available keys and descriptions, these larvae and their reared adults could be referred only to *Aedes diantaeus* H., D., & K., a rare and local northern species first described from Dublin, N. H., but not reported from Massachusetts. However, certain differences, particularly in the larval chaetotaxy, raised some doubts as to the validity of the determination. Accordingly, specimens of larvae and adults were sent to Dr. Robert Matheson of Cornell University, who kindly compared them with his material and wrote, "As far as I can determine, your material is undoubtedly *A. diantaeus* unless you wish to break up the species on the basis of larval characters as found in Massachusetts."

In 1951, however, Mr. John Weidhaas, a graduate student in this department, discovered a rich mosquito breeding pool in Westhampton, Mass., about twenty-five miles north of Belchertown, from which were collected a single larva of the Belchertown type, and other larvae whose structure corresponded rather closely with Dyar's description of the larva of *A. diantaeus*. Adults reared from these larvae possessed terminalia so markedly different from the Belchertown mosquitoes that it became clear that two species were involved, both of which could be keyed out only to *A. diantaeus*.

The question now arose as to which of these two species was the true *diantaeus*. Through the kindness of Mr. C. F. W. Muesebeck and Dr. Alan Stone of the U. S. National Museum, the entire museum collection of adults and larvae of *A. diantaeus*, most of them determined by Dyar, was made available for study. Of nearly 200 adults, all but one proved to be identical in coloration and in structure of the male genitalia with the Westhampton species; the only exception was a single "topotypic" male from Dublin, N. H., which corresponded nearly exactly in size, coloration, and genitalic structure with the Belchertown species. Of the larvae, a single Alaskan specimen was identical with those

[1] Contribution from the Department of Entomology, University of Massachusetts.

from Belchertown; the others fitted Dyar's description of *diantaeus,* but showed sufficient range of variation so that the Westhampton specimens clearly fitted here. It was obvious, therefore, that both species had been collected before, that both had been referred to *diantaeus,* even by Dyar, and that of the two species, the Westhampton form was represented by the majority of specimens, the Belchertown type being even more rare and local than the other.

A collection of adults made at the type locality of *A. diantaeus* in early June yielded five females, captured while biting, and referable to this species. All of these agreed with the Westhampton form, and were clearly distinct from the "topotypic" male. Finally, comparison with Dyar's types in the U. S. N. M. positively confirmed the Westhampton mosquito as the true *diantaeus,* and the Belchertown species as a new one.

Very little confusion between the two species has occurred in the literature. With a few exceptions, references to *A. diantaeus* undoubtedly apply to that species. Unfortunately, one of the exceptions is in Matheson's *Handbook of the Mosquitoes* (1944), in which the description and figure of the male genitalia of *A. diantaeus* are referable to the new species, although the descriptions of the larva and female apply to the true *diantaeus.* This confusion of the two species explains Matheson's confirmation of the Belchertown mosquito as *A. diantaeus* through comparison with his own material; and the slight and not obvious differences between the two species make such confusion understandable and possibly explain why Dyar included only two of the three males collected in Dublin, N. H., in 1909 as types of *diantaeus,* but did not describe the third male as a new species.

Only two other writers, Irwin (1943) and Freeman (1949) indicate by their keys and descriptions that they have encountered the new species. The larvae (presumably from Canada) described briefly by Freeman differ from local specimens only in the antennae, which he says may be "as long as or longer than the head"; in all specimens seen by this writer the antennae are about as long as but not longer than the head. Irwin (1943) discusses the probable occurrence in Michigan of two or more species in the *diantaeus* complex, based upon three types of larvae which were referable to *diantaeus* in keys. As *Aedes sp. 23,* near *diantaeus,* he unmistakably describes larvae of the new species in some detail, considering them sufficiently distinct from known described larvae to warrant a separate description. Unfortunately, only a few specimens were collected, with no adults that could be declared correctly associated. His *Aedes sp. 22,* near *diantaeus,* is essentially identi-

cal with specimens collected in Westhampton, and represents one of the larval variations within this species, differing from other published descriptions of *diantaeus* in the numbers of the lateral abdominal hairs.

With considerable numbers of specimens of most stages of both species available, from numerous localities, it has seemed advisable not only to describe the new species in detail, but to re-describe *A. diantaeus* itself. This procedure affords a better basis for comparison of the two species, and also makes possible inclusion of several characters and a range of variation not considered in previous studies of *A. diantaeus*.

In the descriptions of the larvae, Belkin's (1950) terminology has been adopted; for the pupae, Darsie's (1951) descriptions have been followed; and for the adults, the terminology of Matheson (1944) and of Gjullin (1946). Drawings of comparable parts of the two species are on the same scale.

Aedes (Ochlerotatus) pseudodiantaeus n. sp.

Aedes diantaeus H., D., & K.—Matheson, 1944, Handbook Mosq. N. A., rev., pp. 167–8 (male genitalia only), pl. XVI, fig. 6; Freeman, 1949, Instructive guide for northern insect survey parties, Can. Dept. Agr., Div. Ent., mimeo.: 20, 23 (larva); Barnes, Fellton, & Wilson, 1950, Mosq. News 10: 71 (Dryden, N. Y., reference).

Aedes sp.—Irwin, 1943, Pap. Mich. Acad. Sci., Arts, & Lett. 28: 390 (sp. 23, larva); Weidhaas, 1952, Mosq. News 12 (1); publ. pending.

ADULT FEMALE.—A small black-legged mosquito with paired brown thoracic stripes; wings 3–3.5 mm. long; abdomen 2.5–3 mm. Proboscis and palpi black-scaled. *Torus* (pedicel of antenna) with integument deeply infuscated, a few minute black setae on mesal surface. *Occiput* clothed laterally with flat white scales; dorsally with pale yellow, narrow, curved, procumbent scales, the nape with pale yellow scales shallowly bifid or trifid at apices; with sub-dorsal patches of dark brown flat and erect scales, usually distinct, rarely reduced to a few dark erect scales; setae pale yellow or dark brown. *Anterior pronotal lobes* and *postpronotum* clothed in their lower portions with flat white scales; postpronotum with patch or stripe of dark brown scales usually distinct, or represented by at least a few dark scales; *mesonotum* dark, clothed with narrow, curved, golden to very pale yellow scales; a pair of narrow well-defined longitudinal stripes of very dark brown scales extending to ante-scutellar area or surrounding

it, the stripes separated by a stripe of pale yellow scales narrower than dark stripe; in a few specimens the stripes are less distinctly separated, or less clearly defined from the yellow sides; short posterior half-stripes of dark scales between ante-scutellar area and wing bases often distinct, usually represented by at least a few dark scales; setae golden or brown; *scutellum* with yellow scales and setae; *pleural region* with patches of flat white scales; hypostigial spot of scales absent; post-spiracular setae 2–8 in number; lower mesepimeral setae absent; sternopleural setae (Pl. I, fig. 2) few, usually 5 or 6, not more than 10, with only 1–4 just anterior to the lower edge of mesepimeron, arranged in a vertical line. *Wings* with dark scales, or with a few pale scales restricted to base of second vein; *halteres* with pale stems, knobs pale or slightly infuscated, clothed with flat white scales. *Legs* with very dark purple-brown scales except for coxae, trochanters, and femora ventrally, which are pale with white scales; hind femur with dark scales only on apical half or less, the rest pale-scaled; femora usually with a few pale scales at apices. *Abdominal segments* with dark purple-brown scales dorsally; apical setae pale dorsally, dark ventrally; segments 2–7 basally with lateral triangular spots of white scales, not united; ventrally, the segments white-scaled, each with an apical band of dark scales which is distinctly produced basad as a triangle, the white bands sometimes reduced to lateral basal spots.

FEMALE GENITALIA.—Mr. E. I. Coher, who has kindly examined the female genitalia of the two species, states that they are typically *Ochlerotatus* in appearance (see Coher, 1948). *A. pseudodiantaeus* is smaller, and the few specimens examined (all topotypic) had no more than 5 setae on each posterior lobe. *A. diantaeus* showed a slight broadening of the postgenital plate (noticeable when only the two species are compared) and no specimen examined had less than 7 setae on a posterior lobe nor more than 12. No other differences were noted that were not highly variable.

ADULT MALE.—Similar to female in coloration, but with white scaling of abdomen reduced, patches of dark scales on occiput and postpronotum usually reduced to a few scales, and posterior half-stripes absent or poorly developed.

MALE GENITALIA (Pl. I, fig. 1).—*Diststyle* (clasper) slightly expanded medianly, with usually four sub-apical setae about as long as claw; claw short, tapered. *Basistyle* (side-piece) slender, nearly three times as long as wide, outer margin only slightly concave; *dorsal surface* (fig. 1A) clothed with scales,

spicules, and numerous long and short setae; *apical lobe* short, broadly rounded, reaching almost to basal lobe, its dorsal surface edged mesally with short retrorse setae; ventral surface (fig. 1B) just beyond middle with a brushlike tuft of fine, closely-set setae, golden-brown to black in color, which arise from a narrow elongate patch on the mesal edge, are directed meso-caudad, and surpass apex of basistyle; a smaller patch of similar setae on mesal margin between basal tuft and dististyle; a few very long stout setae near basal tuft and toward apex of basistyle, and a cluster of short setae basad of hair-tuft; *basal lobe* large, quadrangular, surpassing middle of basistyle, clothed with small setae and minute setulae, and bearing at its apex two stout curved spines rising from a common tubercle, mesal spine longer, more angulate, and much flattened; at its base, a long stout spine, borne on a weak protuberance, directed somewhat cephalad, and far surpassing meson. *Claspette stem* stout, curved sharply outward, angulate and curved dorsad beyond middle, narrowed apically, finely setose with a small spine at outer angle; *filaments of claspettes* approximate, each with a slender base and a greatly expanded and arcuate terminal portion armed with sharp recurved dorsal and ventral points. *Tenth sternites* slender, with recurved approximate tips; *anal membrane* with a few small setae at apex; *mesosome* cylindrical, not heavily chitinized, narrowed and constricted at apex, ventral side almost closed, dorsal side closed for a very short distance, the base forming a very thin ring. *Ninth tergite* with small, nearly approximate lobes, each with 4 (sometimes 5) stout spines; *ninth sternite* with caudal margin scarcely invaginated, usually with 2 small setae on each side and a single mid-ventral one.

Females of *A. pseudodiantaeus* can usually be distinguished from those of *A. diantaeus* by the presence of dark scales on the occiput, and also on postpronotum (very rarely present in *diantaeus*); by the often well-developed posterior half-stripes (rare in *diantaeus*); by the deeply infuscated tori; by the smaller size; and by the reduced sternopleural setae. The latter character seems to be most helpful in distinguishing between small specimens, or between *diantaeus* with increased dark markings and *pseudodiantaeus* with reduced dark scales. Separation of the males is not always possible by coloration alone, but the sternopleural setae are helpful.

The genitalia of the males are readily distinguishable; *pseudodiantaeus* lacks the sharply-produced apical lobe of *diantaeus* and the sharp inner angle of the claspette stem; the claspette stem is curved sharply outward, and its filament, broadly expanded in both species, is less flattened and terminates in two, rather than in one,

recurved points; the dense hair-tuft, so conspicuous in both species, is more elongate and is directed more nearly caudad; the ninth tergite lobes bear fewer spines, and the basal spines, the spines at the apex of the basal lobe, the arrangement of the setae on the basistyle, and other characters show constant differences.

LARVA: *Fourth instar* (Pls. II, III).—Length 6–7 mm. *Head* (Pl. II, fig. 1) wider than long. *Antenna* nearly as long as head, at least as long as frontal suture to occiput, tapered and strongly spiculated beyond tuft, sparsely spiculated basad; *antennal tuft* (*1*) inserted just before middle, double and reaching apex of shaft or 3- to 5-branched and shorter; *apex of antenna* (fig. 2) with inner subapical seta (*2*) one-forth to one-fifth as long as antenna, outer subapical (*3*) and terminal (*4*) setae and segmented finger process (*6*) about half as long as first spine, hyaline process (*5*) very short. *Head hairs: preantennal* (*7*) 1- to 4-branched, usually double, half as long as antenna or longer; uppers (*5*) and lowers (*6*) single or double and more than half as long as antenna, rarely all single or all double or an upper triple; hairs often incompletely branched or split toward apex, when single markedly stouter and longer than double hairs; other head hairs minute, 1- to 4-branched, post-clypeals (*4*) between and nearly in a line with the lower head hairs; all macroscopic head and body hairs very coarse and stout (fig. 3), of nearly uniform diameter throughout, scarcely tapered at apex, and sparsely barbed, the barbs scarcely longer than diameter of hair, and visible only under high magnification. *Prothoracic hairs* (fig. 4): #1 single, as long as antenna; #2–4 minute; #5–7 usually single, 5 or 7 very rarely double or triple, all surpassing the head in length. *Lateral abdominal hairs* (6 and 7) both developed and single on segments I and II, #6 single on III–VII, #7 reduced to a small multiple tuft. *Comb* (Pl. III, fig. 1) of eighth segment consisting of 5–7 (usually 6) thorn-shaped scales in a curved even row, much as in *A. implacabilis* Wlk., rarely with some scales out of line; individual scales (figs. 1B, 1C) with a narrow central spine as long as base or longer, the base fringed laterally with spinules which are stronger distally. *Siphon* 3.5–4 times as long as basal width, tapering gradually; *pecten* reaching to middle of siphon or slightly beyond, consisting of 9–12 closely-set teeth and 1–3 stronger somewhat detached teeth; individual tooth with 3 or 4 small denticles on basal half, outermost tooth smooth; *siphonal tuft* (*1*) 3- to 7-branched, at least as long as width of siphon at point of insertion, inserted about a tooth's length beyond pecten; *dorsal preapical hair* (*2*) single, minute. *Dorsal plate* of *anal segment* usually distinctly longer than wide,

incomplete, sometimes touching at points along mid-ventral line but never completely fused; *lateral saddle hair* (*1*) single, shorter than plate; *anal gills* tapered, 1½–2 times as long as dorsal plate; *dorsal brush* consisting of a single lower or outer hair (*3*), and a tuft of 2–4 upper or inner hairs (*2*) about half as long as lower hair or longer; *ventral brush* (*4*) sparsely developed, with 10–12 paired tufts in the barred area, preceded by about 3 small tufts.

Second and third instars.—Essentially as in fourth instar, except that head hairs are single; antennae are somewhat shorter; anterior thoracic hairs are proportionately shorter, not surpassing the head; hair tufts of thorax and abdomen are generally reduced; dorsal plate of anal segment does not extend more than halfway down segment; and pecten often does not reach middle of siphon.

A. pseudodiantaeus can readily be distinguished from *A. diantaeus* in its larval stage by its shorter antennae, the single long seta at apex of antenna, the coarser head and body setae which have such short barbs that they appear almost bare, the reduced number of comb scales, and by other less obvious differences.

PUPA. (Pl. III, fig. 2).—*Cephalothorax: Seta 6* simple, moderately short; *seta 8* long, 2- to 4-branched; metathoracic setae (fig. 2A) medium long, *seta 10* with 2–4 branches, *seta 11* usually double, *seta 12* single or double. *Respiratory trumpet* (fig. 2C) gradually widened apically, constricted at base, somewhat truncate and notched at apex, most of surface reticular; 3.25–3.87 times as long as its greatest width, 4–7 times its own pinna. *Abdomen:* on tergum I, reticulation between float hairs present; *seta K* medium long, usually double (1–3); *seta S* longer, single or double; *seta U* small simple. On terga II–VIII: *seta A* minute, simple, lateral on II–VI; medium long, usually double (1–3) on VII; sparsely plumose, 1- to 3-branched on VIII. *Seta B* medium long on II and VII, longer on III, very long, as long as following tergite, on IV–VI; usually double (1–4) on II–VI, single on VII. *Seta C* small, multiple (2–6) on II; medium long on III–VII, seldom more than half as long as following tergite, single or double. *Seta 1* medium long, usually simple on II–VI, 1- to 4-branched on VII. *Seta 2* medium long and simple or double on II, small on III–VI, medium on VII; 2- to 5-branched on III, usually single (1–4) on IV–VI, double (1–2) on VII. *Seta 3* small on II, usually double (1–4). *Seta 4* small on II–VI, medium on VII; 2- to 4-branched on II, usually double (1–4) on III–IV, usually single on V–VI, single or double on VII. *Seta A′* on VIII medium long, single or double, sparsely plumose. *Seta v* on IX absent. *Paddle* (fig. 2B) ovoid, posterior margin mostly smooth, several rows of well-de-

veloped submarginal denticles of various sizes present, often protruding beyond margin; surfaces sparsely clothed with minute denticles; midrib almost reaching apex; *terminal seta x* well-developed, single, slightly laterad of apex.

A. pseudodiantaeus differs from *A. diantaeus* in the pupal stage most noticeably in the branching of *seta A* on VIII, having only 1–3 simple branches as compared with the 3–5 major branches and 7–15 sub-branches of *diantaeus;* it also differs in its usually smaller size, its shorter and less-branched setae, in the more numerous and relatively larger submarginal denticles of the paddle, and in other points.

In Darsie's pupal key to the species of *Aedes* (1951, p. 9) this species keys out with *A. diantaeus* to couplet 6. It agrees with *A. triseriatus* Say in having seta C usually reduced in length, but does not agree in its other characters, nor with the second part of the couplet.

TYPES.—*Holotype,* ♂, Belchertown, Mass., May 10, 1950 (reared), M. E. Smith. *Allotype,* ♀, same, May 29, 1951. *Paratopotypes:* 20 ♂♂, 46 ♀♀, May 4–15, 1949, May 10–16, 1950, May 11–29, 1951, M. E. Smith; in alcohol, about 50 additional imperfect specimens, same data. Other *paratypes:* 1 ♂, Dublin, N. H., A. Busck (USNM); 1 ♂, Ringwood, Dryden, N. Y., June 11, 1923 (Cornell Univ.); 1 ♂, with associated larval exuviae, Goose Bay, Labrador, June 19, 1948; 1 ♂, same, July 3, 1948; 1 ♀, same, with associated larval & pupal exuviae, June 23, 1948; 1 ♀, same, July 2, 1948; all by H. C. Friesen (CNC); 1 ♀, same, 1949 (CNC). *Nepionotype* (larva), Belchertown, Mass., May 9, 1951, M. E. Smith. *Neanotype* (pupa), same, May 11, 1950, M. E. Smith. Other larval & pupal paratypes: about 100 larvae and larval exuviae, 20 pupae and pupal exuviae, Belchertown, Mass., March–May, 1949–51. M. E. Smith; Fairbanks Circle M. P. 35, Alaska, single larval & pupal exuviae, May 29, 1947 (Gjullin, Wilson, & Stone). Holotype, allotype, nepionotype, and neanotype deposited in USNM; paratypes deposited in USNM, USPHS collections, Canadian National Collection, and collections of Cornell University and the University of Massachusetts.

Other records: Westhampton, Mass., April 22, 1951, M. E. Smith (larva, instar IV); Sunderland, Mass., April 28, 1951, E. I. Coher (larva); Bryant's Bog and Mud Lake, Cheboygan Co., Michigan, April–May, 1937–39, W. H. Irwin (larvae described).

DISTRIBUTION.—It is to be expected that the species will follow approximately the same distribution as *A. diantaeus,* through northern United States, Canada, and Alaska, since the two species

have been taken in the same localities in Massachusetts, New Hampshire, Labrador, Michigan, and in close proximity in Alaska.

BIOLOGY.—Larvae and pupae of *A. pseudodiantaeus* were collected in a sphagnum bog-swamp in Belchertown, Mass., in 1949, 1950, and 1951 in considerable numbers, often 15 or 20 to the dip. Associated with the species were *A. implacabilis* Wlk., *A. excrucians* Wlk., *A. canadensis* Th., *Mochlonyx culiciformis* DeG., and *Culiseta morsitans* Th. in abundance; a few *A. cinereus* Mg. and *Corethrella brakleyi* Coq.; single specimens of *Culex apicalis* Ad. and *Culiseta melanura* Coq.; and numerous larvae of *Wyeomyia smithii* Coq. in the pitcher plant leaves. First instar larvae of *A. pseudodiantaeus* were collected with first instar *implacabilis* as early as March 24 (1951), before the ice had completely disappeared from the swamp. By April 1, both first and second instars were present, along with first instar *A. excrucians* and *M. culiciformis.* Third instars were collected on April 18, with first instar *A. canadensis* and *C. morsitans;* some larvae of *implacabilis* had reached fourth instar by this time, and their pupae were found a few days later. Fourth instar *pseudodiantaeus* were found from April 20 (1949) and May 4 (1951) through May 15 (1951); pupae were found from May 7 (1949) through May 15 (1951) but must have been present for a few more days as fourth instar larvae were collected on the latter date. All larvae and pupae of *pseudodiantaeus* had disappeared by May 29. *A. implacabilis* adults had all emerged before the last *pseudodiantaeus* larva pupated; *A. excrucians* pupated almost simultaneously with *pseudodiantaeus; A. canadensis, A. cinereus, C. morsitans, M. culiciformis,* and *C. apicalis* were present in second, third, and fourth instars during the pupal period of *pseudodiantaeus,* although by May 29 many of these had pupated.

The swamp lies in an extensive low area, at altitude 425′, about one mile south of Belchertown on the Bondsville Road. It is densely overgrown throughout with swamp shrubs such as highbush blueberry, with numerous spruces, many of them dead, and is shaded by bordering hemlocks and hardwoods. Several feet of water stand in the swamp in the spring; by early summer the edges dry, and the center becomes a quaking bog; late in the season it dries completely. The edges are characterized by tufts of sedges and by shallow shaded or sunlit pools filled with fallen leaves, where *A. implacabilis, A. excrucians,* and *A. canadensis* are particularly abundant. The central area, reached safely in spring only on fallen logs or by hopping from one island of shrubby vegetation to another, is filled with dense pockets of sphagnum moss, with scattered clumps of pitcher plant. It is in the deepest and coldest sphagnum

pools that *pseudodiantaeus* occurs. While any of the mosquito species of the swamp may occur in these pools, often *pseudodiantaeus* occurs alone or with only a few larvae of *A. excrucians* or *C. morsitans* intermixed. Although the larvae taken from this Belchertown swamp were associated with the deep sphagnum pools, the single specimens collected in Westhampton and Sunderland came from quite different types of habitats, a woodland pool and a permanent bog, neither one characterized by sphagnum moss; possibly the absence of more suitable conditions was the reason for the number collected.

In the early afternoon of May 29, 1951, a warm overcast day, many adult females were captured in the central area of the swamp. They came in numbers to clothing, stockings, face, and arms, attacking readily but with a scarcely noticeable bite, and were easily captured before biting. Their song is a very thin high whine, much higher than that of their associates, *A. canadensis* and *A. implacabilis*. Males were noted hovering about females in the shrubbery, singly; no swarming was observed.

(To be concluded in the April issue)

Schinia brevis Grote—a synonym. For many years *S. brevis* has existed as a valid species but it must fall into synonomy in favor of *Schinia septentrionalis*. The type of *S. septentrionalis* was described by Walker in 1858 from a female now in the British Museum. *S. brevis* was described from a male in 1864 by Grote. He unwittingly added to the list a species that held no validity but his error was excusable. The males differ from the females in having a yellow basal area and generally lighter maculations.

Large numbers have been captured in this area in recent years and a number have been bred. Mr. W. H. T. Tams of the British Museum very kindly compared females from the material from here and stated that the specimens were undoubtedly *S. septentrionalis*. It should be further stated that the flown specimens differ rather sharply from the fresh ones inasmuch as they become lighter in maculation and vary in proportion to the amount of scales lost in flight. No doubt other species will fall in time when large series are available for comparison.

References used are listed as follows: *S. septentrionalis,* Cat. of British Museum XV, p. 1744, 1858; Smith Cat. 283; *S. brevis* Grote, Proc. Ent. Soc. Phil., 111, p. 530, 1864; and Smith Cat. 283.
—Leslie Banks, Chicago, Illinois.

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WANTED—Proc. Ent. Soc. Phila., vols. 1–6; Proc. Calif. Acad. (Nat.) Sci., vols. 1–7; Psyche, vols. 11, 13, 15; Trans. Amer. Ent. Soc., vols. 1–5; Bull. Buff. Soc. Nat. Sci., vols. 2–3; Proc. Acad. Nat. Sci. Phila., vols. 1–8. C. F. dos Passos, Mendham, New Jersey.

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Vol. XLVII APRIL, 1952 No. 2

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OF THE

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CONTENTS

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BULLETIN

OF THE

BROOKLYN ENTOMOLOGICAL SOCIETY

Vol. XLVII APRIL, 1952 No. 2

A NEW NORTHERN AEDES MOSQUITO, WITH NOTES ON ITS CLOSE ALLY, AEDES DIANTAEUS H., D., & K. (DIPTERA, CULICIDAE).[1]

By Marion E. Smith, Amherst, Mass.

(Continued from the February issue)

Aedes (*Ochlerotatus*) *diantaeus* H., D., & K.

Aedes diantaeus H. D., & K., 1917, Mosq. No. & Cent. Am. IV: 758; II: pl. 24, fig. 167.—Dyar, 1919, Ins. Ins. Mens. 7: 20 (larvae, Ont.).—Dyar, 1920, Ins. Ins. Mens. 8: 7 (Br. Col.).—Edwards, 1921, Bull. Ent. Res. 12: 311 (Finland, Denmark).—Dyar, 1921, Trans. Roy. Can. Inst. 13: 92 (Pt. 1).—Wesenberg-Lund, 1921, Danske Vid. Selsk. Skr. nat.—mat. Afd. 7(1): 88–91 (Denmark, fig. larva).—Dyar, 1922, Proc. U.S.N.M. 62: 54 (Montana).—Dyar, 1922, Ins. Ins. Mens. 10: 68; 85 (Glacier Park).—Dyar, 1923, Ins. Ins. Mens. 11: 43 (Yellowstone Park).—Dyar, 1928, Mosq. Amer. p. 174, pl. 39, fig. 128 (larva, male genitalia).—Mondschadsky, 1930, Zool. Yahrb. Allg. Zool. 58: 601–603 (Russian Far East; larva, instars I–IV).—Martini, 1930, *In* Lindner, Flieg. Paleark. Reg. 11 and 12, p. 274 (fig. larva).—Edwards, 1932, Gen. Ins. Fasc. 194: 144.—Mail, 1934, Mont. Agr. Exp. Sta. Bull. 288: 24.—Mondschadsky, 1936, Faune URSS Moscow #24: 253–255 (figs.).—Owen, 1937, Minn. Agr. Exp. Sta. Tech. Bull. 126: 35–36, fig. 4 (distribution, Minn.).—Tulloch, 1939, Psyche 46: 122, 123 (keys).—Irwin, 1941, Ent. News 52: 102 (Michigan).—Irwin, 1942, Ecol. 23: 472–476.—Irwin, 1943, Pap. Mich. Acad. Sci., Arts, & Lett. 28: 384–385, 389–390 (*Aedes sp.* 22).—Matheson, 1944, Handbook Mosq. N. A., rev., pp. 167–168 (larva & female only).—Gjullin, 1946, Proc. Ent. Soc. Wash. 48: 215–221.—Natvig,

[1] Contribution from the Department of Entomology, University of Massachusetts.

1948, Norsk. Ent. Tidsk. Suppl. I: 362–363 (fig.).—Barnes, Fellton, & Wilson, 1950, Mosq. News 10: 71 (Lake Placid, N. Y., reference); Hennig, 1950, Die Larvenformen der Dipteren, Teil 2: 152.—Rempel, 1950, Can. Journ. Res. (D) 28: 224, fig. 25 (larva) (Alaska).—Mondschadsky, 1951, Larvae of bloodsucking mosquitoes of Russia and neighboring countries, Moscow, #37: 174–175 (fig.).—Yamaguti and LaCasse, 1951, Mosquito Fauna N. A. Pt. V (Aedes): pp. 13, 14, 25, 67–69; pls. XXI, XXII (larva & adults); Office of the Surgeon, HQ Japan Logistical Command.—Weidhaas, 1952, Mosq. News 12 (1); publ. pending.

Aedes serus Martini, 1920, Arch. f. Schiffs.—u. Trop. Hyg. 24: 96–99, figs. 27–29 (Germany; larva & male).—Synonymized by Edwards, 1921, loc. cit.; Dyar, 1922, Ins. Ins. Mens. 10: 68.

ADULT FEMALE.—A medium-sized, black-legged mosquito with paired brown thoracic stripes; wings 4–6 mm. long, usually 5–6 mm.; abdomen 3–3.5 mm. Proboscis and palpi black-scaled. *Torus* (pedicel of antenna) with integument of outer posterior side yellow to light brown, rarely infuscated; infuscated mesally, with a cluster of small dark setae and sometimes a few dark scales. *Occiput* clothed with pale yellow scales, without spots or stripes of dark scales; dorsally with narrow, curved, procumbent scales, the nape with narrow erect scales shallowly bifid; laterally with flat scales; setae pale or brownish. *Postpronotum* usually pale-scaled, sometimes with a few dark scales or rarely (4 specimens out of 200) with a large distinct patch of dark scales; *mesonotum* dark, clothed with narrow curved scales, golden to pale yellow in color; a pair of narrow, well-defined, longitudinal stripes of very narrow dark brown scales extending to ante-scutellar area or surrounding it, the stripes sometimes coalesced into a single broad, median one, but usually separated by a band of pale scales not wider than one of the brown stripes; posterior half-stripes of dark scales rarely distinct, sometimes represented by a few dark scales intermediate between ante-scutellar area and wing-base; thoracic setae golden or brown; *scutellum* with yellow scales and setae; anterior pronotal lobes and postpronotum clothed in their lower portions with flat white scales; *pleural region* with patches of flat white scales; hypostigial spot of scales absent; post-spiracular setae 8–10 in number; lower mesepimeral setae usually absent, single in 13 and double in 4 specimens out of 200; sternopleural setae (Pl. I, fig. 4) well-developed, 12–20, with 7–12 in a patch just anterior to and below lower edge of mesepimeron. *Wings* with dark scales, pale

scales restricted to base of second vein, costa entirely without pale scales; *halteres* with pale stems, knobs pale or slightly infuscated, clothed with flat white scales. *Legs* with very dark purple-brown scales, except for coxae, trochanters, and femora ventrally, which are white-scaled; hind femur with dark scales only towards its tip, remainder white-scaled; femora usually with a few pale scales at apices. *Abdominal segments* with dark purple-brown scales dorsally; segments 2–7 laterally with basal triangular spots of white scales, sometimes united by a narrow basal white band; ventrally, the segments white-scaled, with apical dark bands slightly produced basad medianly.

ADULT MALE.—Similar to female, usually smaller in size; tori often deeply infuscated.

MALE GENITALIA (Pl. I, fig. 3).—*Diststyle* (clasper) broadly expanded medianly, armed with about four sub-apical setae; claw short, tapered. *Basistyle* (side-piece) stout, about twice as long as wide, outer margin markedly concave; *dorsal surface* (fig. 3A) clothed with scales, spicules, and long and short setae; *apical lobe* conical, well-developed, sharply projecting mesally, clothed with small retrorse setae on dorsal surface and mesal margin; *ventral surface* (fig. 3B) just beyond middle with a brush-like tuft of fine, closely-set setae, golden-brown to black in color, which arise from an oval patch near mesal edge, are directed mesad, and surpass margin of apical lobe; a few short and a few very long setae between hair-tuft and outer margin; apex and mesal margin distad of hair-tuft without setae, basal portion with scales and a cluster of fine short setae just basad of hair-tuft; *basal lobe* prominent, conical, reaching to middle of basistyle, clothed with small setae and minute setulae, bearing at its apex two stout curved spines rising from a common tubercle, mesal spine slightly longer and somewhat flattened; at its base, a long stout spine, borne on a distinct sclerotized protuberance, directed somewhat caudad and scarcely reaching meson. *Claspette stem* long, setose, apical fourth slender; basal portion stout, constricted and narrowed before apex so as to form a sharp mesally-projecting shoulder armed with several small setae; *filaments of claspettes* approximate, large, each with a short slender base and a broadly expanded but flattened apical portion roughly triangular in shape and ending in a dorsally recurved tip. *Tenth sternites* stout, with recurved approximate tips; *anal membrane* densely covered apically with minute setae; *mesosome* cylindrical, not heavily chitinized, narrowed and constricted before apex, narrowly open along median ventral line, dorsal side

closed for a short distance, and base forming a very thin ring. *Ninth tergite* with large approximate lobes, each with 6 or 7 stout spines; *ninth sternite* with caudal margin deeply invaginated, usually with 3 small setae on each side.

Adults of *A. diantaeus* are usually distinguished from similarly-marked individuals of *A. communis* DeG., *A. sticticus* Mg., and other black-legged mosquitoes by the absence of pale scales on torus, base of costa, and legs beyond femora; by the absence of dark scales on occiput and on lateral edge of mesonotum just anterior to wing-base; by the well-defined dark thoracic stripe or stripes; usually by the complete absence of lower mesepimeral setae; and by the abdominal markings: the white basal band usually reduced to lateral spots, and the sternites banded apically with dark scales.

LARVA: *fourth instar* (Pls. II, III).—Length 8–10 mm. *Head* (Pl. II, fig. 5) wider than long. *Antenna* strikingly longer than head, slender, curved, uniformly tapered, well-spiculated throughout; *antennal tuft* (*1*) inserted at or slightly before middle, 3- to 7-branched, reaching apex of shaft or beyond; *apex of antenna* (fig. 6) with a terminal (*4*) and two sub-apical (*2, 3*) setae about equal in length, and about one-fifth as long as antenna, a segmented finger process (*6*) about half their length, and a very short hyaline process (*5*) or papilla. *Head hairs: preantennal* (*7*) 3- to 6-branched; *uppers* (*5*) with 3 or 4 branches, rarely 2 or 5; *lowers* (*6*) 2- or 3-branched; all about half as long as antenna; other head hairs minute, *post-clypeals* (*4*) multiple and on a line with or slightly anterior to upper head hairs; all macroscopic head and body hairs (fig. 3) densely barbed, the barbs long and easily seen, the hairs fine and tapered. *Prothoracic hairs* (fig. 4): #1 single, as long as head hairs; #2–4 minute; #5 and 6 single, #7 double, not surpassing the head. *Lateral abdominal hairs* variable: double or triple on segment I, single, double, or triple on II, and single or double on III–VII; on segment I, upper (*6*) and lower (*7*) lateral hairs may be single or double (rarely both double), or upper hair single and lower double; on segment II, upper hair single or

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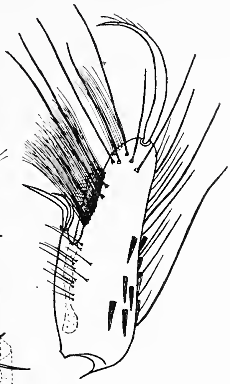
Explanation of Plate I.

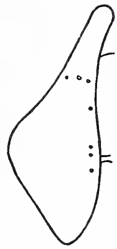
Figs. 1, 2. *Aedes pseudodiantaeus,* adult. Fig. 1, male genitalia: 1A, dorsal aspect; 1B, ventral aspect. Fig. 2, left sternopleuron, showing arrangement of setae.

Figs. 3, 4. *Aedes diantaeus,* adult. Fig. 3, male genitalia: 3A, dorsal aspect; 3B, ventral aspect. Fig. 4, left sternopleuron, showing arrangement of setae.

1A



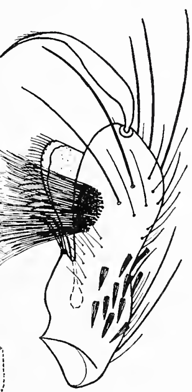
1B



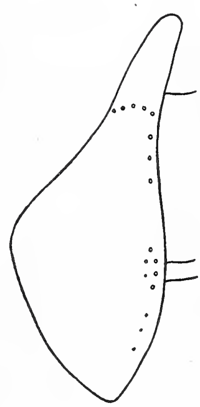
2

AEDES PSEUDODIANTAEUS

3 A



3 B



4

AEDES DIANTAEUS

double, lower hair single or represented by a minute multiple-branched tuft; combinations may differ on the two sides of a single specimen, and on specimens from the same locality; on III–V upper hair may be single or double, lower usually a tuft. *Comb* (Pl. III, fig. 3A) of eighth segment consisting of 6–13 thorn-shaped scales in a curved irregular row or double row; individual scale (fig. 3B) with long central spine as long as its base, without lateral fringes of small spinules. *Siphon* usually 2.5–3 times as long as wide, tapering slightly; *pecten* usually not quite reaching middle of siphon, with 12–16 closely-spaced teeth and 1–3 larger somewhat detached teeth; individual tooth including outermost with 4–7 small denticles from base to beyond middle; *siphonal hair tuft* (*1*) 4- to 8-branched, seldom longer than diameter of siphon at point of insertion, inserted just beyond pecten, close to middle of siphon; *dorsal preapical hair* (*2*) minute, single. *Dorsal plate* of *anal segment* as long as wide or longer, lower edges rounded, nearly meeting along mid-ventral line; *lateral saddle hair* (*1*) simple, very short; *anal gills* tapered, 1.5–2 times as long as anal plate; *dorsal brush* consisting of a single inner or lower hair (*3*), and a tuft of 5–12 upper or outer hairs (*2*) not half as long as lower hair; ventral brush (*4*) well-developed, with about 17 paired hair tufts in the barred area, preceded by 2 or 3 small tufts.

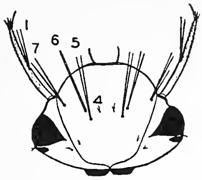
Second and third instars: Essentially as in fourth instar, except that upper and lower head hairs are single or double, antennae are shorter, but as long as the head; hair tufts of thorax and abdomen are generally reduced; dorsal plate of anal segment does not extend more than half-way down side of segment.

PUPA (Pl. III, fig. 4).—*Cephalothorax: Seta 6* simple or double, very short; *seta 8* of medium length, 3- to 6-branched; metathoracic setae (fig. 4A) long, *seta 10* plumose, 2- to 7-branched; *setae 11 and 12* usually single or double (1–4). *Respiratory trumpet* (fig. 4C) gradually widened apically, constricted at base, somewhat truncate and notched at apex, most of surface reticular; 3–4.5 times as long as its greatest diameter, 7–9

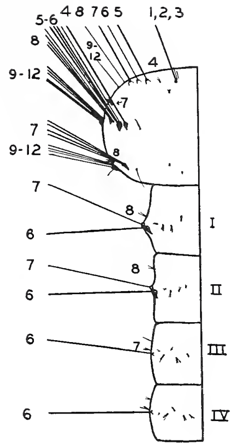
Explanation of Plate II.

Figs. 1–4. *Aedes pseudodiantaeus,* larva. Fig. 1, head, dorsal aspect. Fig. 2, apex of antenna. Fig. 3, portion of a seta. Fig. 4, thorax and abdominal segments I–IV, dorsal aspect.

Figs. 5–8. *Aedes diantaeus,* larva. Fig. 5, head, dorsal aspect. Fig. 6, apex of antenna. Fig. 7, portion of a seta. Fig. 8, thorax and abdominal segments I–IV, dorsal aspect.



1



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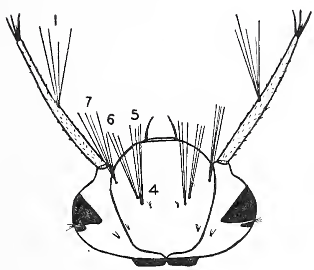
2

3

AEDES PSEUDODIANTAEUS



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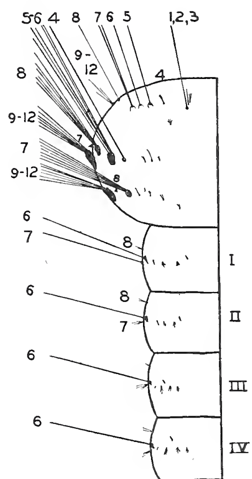

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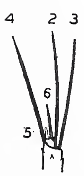

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7

AEDES DIANTAEUS

times its own pinna. *Abdomen:* on tergum I, reticulation between float hairs present; *seta K* medium long, plumose, usually double (1–3); *seta S* very long, single; *seta U* small, simple, rarely double (1–3). On segments II–VIII: *seta A* minute, simple, lateral on II–VI; slightly plumose, 3- to 5-branched on VII; plumose, with 4–7 major branches and 7–15 sub-branches, on VIII. *Seta B* medium long on II and VII, longer on III, very long, longer than following tergite, stout, and slightly plumose on IV–VI; usually double (2–3) on II, chiefly double (1–2) on III–VII. *Seta C* medium long on II–V, seldom more than half as long as following tergite, longer on VI and VII; 3- to 9-branched on II, usually double (2–4) on III, single or double on IV–VII. *Seta 1* small on VII, medium long on II–IV, longer on V–VI; single or double (1–3) on II–IV, single on V–VI, 5- to 8-branched on VII. *Seta 2* very long on II, small on III–V, medium long on VI, long on VII; chiefly double (1–7) on III–VII, simple on II. *Seta 3* small, 2- to 6-branched on II. *Seta 4* small on II–IV, medium long on V–VII; 5- to 9-branched on II, 2- to 8-branched on III–V, double or triple on VI–VII. *Seta A′* on VIII long, single or double. *Seta v* on IX absent. *Paddle* oval, posterior margin (fig. 4B) mostly smooth, with several rows of small submarginal denticles present, a few protruding beyond margin; surfaces sparsely clothed with minute denticles; midrib almost reaching apex; *terminal seta x* well-developed, simple, slightly laterad of apex.

The pupa of *A. diantaeus,* previously undescribed, works out to couplet 6 of Darsie's pupal key to the species of *Aedes* (1951, p. 9), though with some minor difficulties. It differs from either alternative in having *seta C* short on segments III–V, and longer than half the length of the following tergite on VI–VII; it differs from *A. triseriatus* in all characters given.

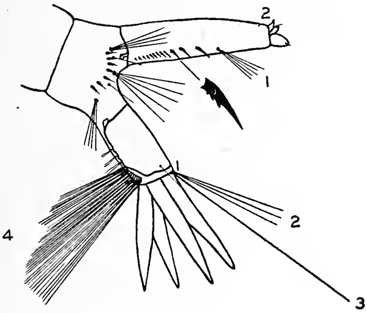
Explanation of Plate III.

Fig. 1. *Aedes pseudodiantaeus,* larva: 1A, caudal end, lateral aspect; 1B, comb scale from center of comb; 1C, comb scale from outer portion of comb.

Fig. 2. *A. pseudodiantaeus,* pupa: 2A, metathorax and abdominal segments, dorsal aspect; 2B, paddle, with section of posterior margin enlarged; 2C, trumpet.

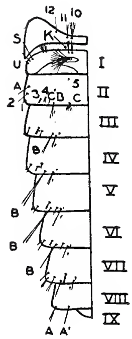
Fig. 3. *A. diantaeus,* larva: 3A, caudal end, lateral aspect; 3B, comb scale from center of comb.

Fig. 4. *A. diantaeus,* pupa: 4A, metathorax and abdominal segments, dorsal aspect; 4B, paddle, with section of posterior margin enlarged; 4C, trumpet.



2 B

2 C

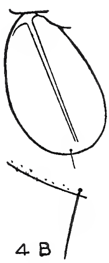


2 A

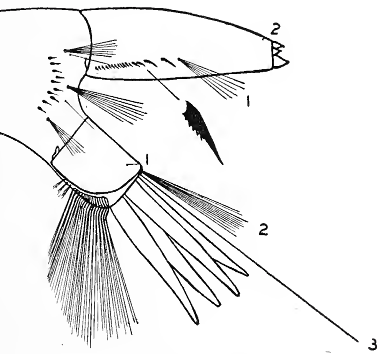
1 B

1 C

AEDES PSEUDODIANTAEUS



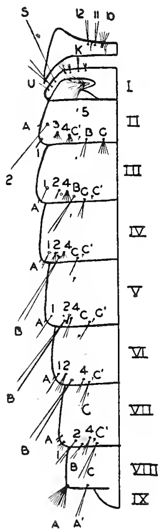
4 B



3 A

3 B

4 C



4 A

AEDES DIANTAEUS

DISTRIBUTION.—Forested areas of northern United States from Maine to Montana and Wyoming; Canada, Labrador, and Alaska; northern Europe: Germany, Finland, Denmark; and the Russian Far East.

SPECIMENS EXAMINED.—*Maine:* Old Town, May 15, 1949, 5 larvae (instars III & IV), (U.S.P.H.S.). *New Hampshire:* Dublin, May and June, 1909 (A. Busck), 2 male types (USNM); June 2, 1951 (M. E. Smith), 5 females (biting). *Vermont:* Jacksonville, May 17, May, 1947 (H. D. Pratt), 2 larvae (III, IV) (USPHS). *Massachusetts:* Westhampton, April 30–May 4, 1951, (J. Weidhaas, M. Smith), 5 males, 4 females (reared); June 6, 1951 (M. Smith, E. Coher), 2 females (biting). *New York:* Lake Placid, July 26, 1945 (E. Kass), 2 larvae (III, IV), (USPHS). *Michigan:* Douglas Lake, July 1, July 15, 1922 (R. Matheson), 2 females (USNM). Bryant's Bog, Cheboygan Co., May 8, 1937 (W. Irwin), 4 larvae (Cornell Univ.). *Wyoming,* Yellowstone National Park: Yellowstone Canyon, July 2, 1922, (Dyar), 1 male, 1 female (USNM); South Gate, June 14, 1951 (Stotanovich), 2 larvae (IV), (USPHS). *Montana:* Whitefish, July 16, 1921 (Dyar), 3 females (USNM). McDonald Cr., June 23, 1921 (Dyar), 6 females (USNM). No. Fork Ranger Station, Glacier National Park, May 5–29, 1926 (Dyar), 8 males, 13 females, larval & pupal exuviae on slide (USNM). *Labrador:* Goose Bay, June 14, 1948 (H. C. Friesen), 1 male, larval exuviae; June 12, 1950, 1 male (Can. Nat. Coll.). *Ontario:* White River, June 17, 1918 (Dyar), 6 males, 10 females, 3 slides of larval and pupal exuviae (many per slide), (USNM). *Manitoba:* Winnipeg, May 10, 1922 (Dyar), 1 female (USNM). *British Columbia:* Salvus, June 9, 1919 (Dyar), 1 male (USNM). Terrace, Aug. 12–14, 1919 (Dyar), 128 females (USNM). *Northwest Territories:* Norman Wells, June 21, 1949 (W. R. M. Mason), 1 female (CNC). *Alaska:* Anchorage, May 16, 1947 (Stone & Jenkins), 1 female (with larval and pupal exuviae), June 4, 1947, 1 female; Palmer M. P. 23, June 6, 1947, 1 female. Steese Highway, M. P. 28, May 29, 1947 (Gjullin, Wilson, & Stone), 1 male (with larval & pupal exuviae); all in USNM.

Dr. J. R. Vockeroth has kindly examined the specimens of *A. diantaeus* in the Canadian National Collection; the species is there represented from the following additional localities: Moose Factory and Meach Lake, Ontario; Whitehorse, Yukon, Norman Wells, and Yellowknife, Northwest Territories; and Gillam, Manitoba. Larvae described by Irwin (1943) from Bryant's Bog,

Cheboygan Co., Michigan, May 22, 1937, and females (June 12, 1937) and larvae (April 30–May 28, 1938) from Mud Lake, Cheboygan Co., are certainly of this species. So also are those described by Owen (1937) from Minnesota (Cloquet Forest Exp. Station and other unnamed localities) ; he records adults as occurring from June 26–July 12; larvae from late May to July 3.

Dr. H. D. Pratt states that the U. S. Public Health Service has records of *A. diantaeus* from Belknap, Cheshire, and Coos Co., New Hampshire, and from Hancock Co., Maine. These have not been verified, and might refer to either species, as could Johnson's citation (*List of the Diptera of new England,* 1925) of *A. diantaeus* as occurring on Mt. Desert Island, Maine, July 7–25.

BIOLOGY.—The species is one of the early spring breeding forms with but a single generation a year, and typically occurs in cold shaded pools in forested areas. Dyar reported the larvae as developing in early spring pools left by melting snow (1917), in mossy pools in a spruce bog (1919), and in flood pools in a river valley (1920). Irwin (1943) collected larvae from pools among aspens at the margin of a bog. Kass (Barnes, Fellton, & Wilson, 1950) found them in a stagnant ditch in the woods. Locally, Weidhaas (1952) found them in a shaded and much overgrown woodland pool in a pine forest. Here they matured simultaneously with *A. implacabilis* Wlk., *A. intrudens* Dyar, and *A. excrucians* Wlk., a little later than *A. triçhurus* Dyar and *A. communis* DeG., and earlier than *A. canadensis* Th., *A. fitchii* F. & Y., *A. cinereus* Mg., and *Culiseta morsitans* Th. While adults usually appear in late May or early June, larvae have been collected in early July by Owen (1937) in Minnesota, and in late July by Kass (loc. cit.) at Lake Placid, New York.

Summary

A new species of *Aedes* mosquito closely related to *A. diantaeus* has been found in Massachusetts, with other scattered specimens from New Hampshire, Michigan, Labrador, and Alaska. Although a few of the *diantaeus* references in the literature apply to the new species, most references are to the true *diantaeus,* a more abundant species. Descriptions are given, for both species, of the adult male and female, the genitalia (male and female), the pupae, and the last larval instar, with brief synopses of earlier instars. The pupa of *A. diantaeus* has not previously been described. Distributional and literature records, notes on the biologies, drawings of the larvae, pupae, and male genitalia, and differences between the two species are included.

The writer wishes to express deep appreciation to the following for their kindness in supplying material and needed information for this study: Mr. C. F. W. Muesebeck and Dr. Alan Stone of the U. S. National Museum; Dr. W. H. Irwin of Oklahoma A. & M. College; Dr. Robert Matheson of Cornell University; Dr. H. D. Pratt of the U. S. Public Health Service; and Dr. J. R. Vockeroth of the Canadian Department of Agriculture; and to members of this department: Mr. E. I. Coher for his notes on the female terminalia; Dr. F. R. Shaw for introducing me to the mosquito-breeding areas of Belchertown; Mr. John A. Weidhaas, Jr., for his discovery of the breeding place of *A. diantaeus;* and to Dr. C. P. Alexander, for his helpful encouragement and advice.

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AUTHOR'S POSTSCRIPT.—A single male specimen of *Aedes diantaeus* H., D., & K. from Hayward, Wisconsin (May 22, 1934, CCC survey) has been received from the U.S.N.M. This is apparently the first record of the species from that state.

The description of the adult of *A. pseudodiantaeus* (p. 22) implies that the legs are entirely dark-scaled beyond the femora. It should be noted that while they are entirely dark-scaled *dorsally* beyond the femora, and at first examination appear to be entirely so, the ventral surfaces of the tibiae and of the first tarsal segments of the fore and middle legs usually show a thin irregular streak of pale scales overlying the dark ones, not easily distinguishable from light glare, and not evident in rubbed specimens. The remaining tarsal segments and the posterior tibiae and tarsi are dark-scaled.

THE OCCURRENCE OF ULTRAMICROSOPIC BODIES WITH LEAFHOPPERS AND MOSQUITOES.

By G. S. Tulloch,[1] J. E. Shapiro[1] and G. W. Cochran.[2]

The purpose of this preliminary note is to record the presence of certain ultramicroscopic bodies, hitherto undescribed, which were recovered from leafhoppers collected in Utah and mosquitoes collected in Puerto Rico.

These bodies vary between 240–600 millimicrons in diameter (Fig. 1). Their shape approximates that of a polar compressed truncated spindle. The derivation of this geometric solid can be visualized as a flexible slotted cylinder which is compressed by applying a force at the ends. They may occur singly or as aggregates joined to one another in irregular fashion. No information is available at this time as to their origin, nature or role in connection with insects.

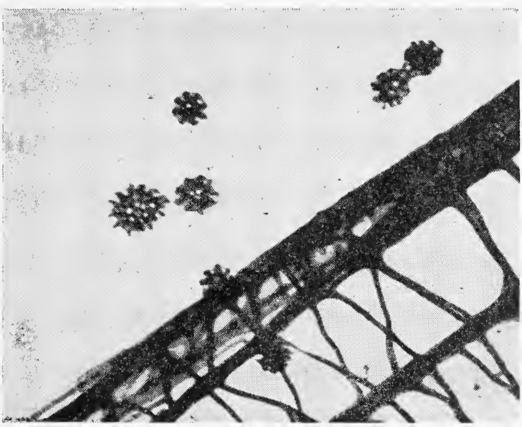

Fig. 1. Ultramicroscopic bodies associated a with wing scale of *Uranotaenia sapphirina* (16,500 ×).

The association of these bodies with leafhoppers in Utah was discovered incidental to studies on the role of these insects in the transmission of viruses. There is some evidence that they are

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found in the circulatory fluid of leafhoppers although this association cannot be indicated with certainty at this time. Examples of species positive for these bodies are *Circulifer tenellus* (Baker) and *Macrosteles divisus* (Uhler).

Their association with certain mosquitoes was discovered while studying the structure of scales removed from the wings of specimens which were collected in the Mayaguez region of Puerto Rico in 1935. They were found both on the trellis work of the scales as well as on the filmed grids on which the scales were mounted. The species positive for these bodies were *Chaoborus brasiliensis* Theobald and *Uranotaenia sapphirina* (Osten-Sacken) taken in light traps in which the catches were predominantly male. Mosquitoes of the genera Aedes, Culex and Anopheles taken in the same traps were negative for these bodies. Thus as far as Puerto Rican mosquitoes are concerned, a restricted association is indicated.

The occurrence of these bodies with living Utah leafhoppers and certain dead Puerto Rican mosquitoes does not offer any positive clue as to their relationship with these insects. It is possible that they are intrinsic parts of specific insects which have not been observed because of their small size. It also is possible that they have an extrinsic origin and merely are contaminants of one kind or other. Since the leafhoppers and the mosquitoes reported positive for these bodies all are primarily plant feeders a plant origin or association might be postulated.

NOTICE

NOTES ON NORTH AMERICAN MUTILLIDAE I. SOME NEW SPECIES OF ODONTOPHOTOPSIS.

By Rudolf M. Schuster, University, Miss.

In the process of completing certain investigations of the morphology and phylogeny of the Sphaeropthalmine complex of the Mutillidae, the writer has come into contact with a number of new species belonging to this group. Since it is not feasible to publish descriptions of these new species in Part II of the author's "A revision of the Sphaeropthalmine Mutillidae of America north of Mexico" in conjunction with the morphological discussion, these descriptions are herewith separately published. For a more detailed discussion of the interrelationships of the two species of *Odontophotopsis* that are published here, the succeeding parts of the writer's work on the Sphaeropthalmine Mutillidae of America north of Mexico should be consulted.

Odontophotopsis (O.) biramosa n. sp.

Male: Length 12.5 mm. Body almost uniformly testaceous, with a moderate vestiture of simple and subplumose to plumose hairs; legs and antennae concolorous; sculpture moderate to weak.

Head in dorsal (posterior to clypeus) rather distinctly transversely rounded-rectangular, excluding the moderately strongly bulging eyes, the dorsum with small, distant, setigerous punctures, the integument therefore rather highly polished, the punctures somewhat denser but still separated on the lower front, above the scrobal teeth and anterior to median ocellus; vertex behind eyes parallel for a short distance, behind which the head is evenly rounded into the subtruncate-arcuate posterior aspect of head; head width including eyes 2.70 mm.; width of vertex directly behind eyes 2.33 mm.; length of head from interantennal sinus to occipital ridge 1.88 mm.; length of vertex behind eyes 0.85 mm.; width of front between eyes 1.35 mm. (exactly 0.50 the head width). Eyes rather large and protuberant, polished, their length 1.04 mm. (the front 1.3 the eye-length). Ocelli large, salient, the posterior 0.38 mm. long; ocellocular distance 0.54 mm. (1.42 ocellar length; 0.52 the eye-length); interocellar distance 0.50 mm. (slightly narrower than ocellocular distance). Clypeus highly modified, at median base elevated in a strongly arched, sharp transverse ridge, produced as a hood-like or shortly nasutiform process over the clypeus, the anterior portion of it strongly con-

cave; clypeus distally produced into a trapezoidal broad, narrowly truncate lobe, the truncation broadly, shallowly emarginate; anterior fourth of clypeus rather densely setigerously punctate and punctulate, with a short beard of subdecumbent, fine hairs and some longer, sparser, setose hairs near middle of anterior margin. Mandibles extraordinarily grotesque, strongly dorsiventrally dilated and with sharp, strongly arcuate, carinate dorsal rims that end in the large, bladelike dorsal tooth; ventral margins interrupted near base by a large protruding ventral tooth (length of ventral margin to apex of tooth 0.54 mm.; width at ventral tooth 0.38 mm.); beyond which the mandibles are strongly constricted and incised ventrally, and sinuously narrowed dorsally, the maximum width of external face at incision merely 0.18 mm. (less than 0.5 width at tooth); from point of incision on the mandible strongly dilated, bladelike, becoming 0.53 mm. wide shortly before the margin; the dilated distal portion of the mandible biramose, divided into a large dorsal tooth, separated by a deep, semilunate sinus from the very large, acute ventral tooth, at whose inner base is a small, but sharply produced median tooth; the mandibular apex therefore tridentate with the dorsal tooth separated from the pair of ventral teeth by a deep, rounded sinus; basal half of mandibles strongly, closely, setigerously punctate, the distal third of mandibles with only a very few setose punctures, polished, thin and bladelike. Antennal scrobes nitid, armed above with a distinct tubercle but no distinct suprascrobal ridges. Scape circa 1 mm. long, with an obscure ventral ridge and otherwise setigerously punctate surface; pedicel 0.15 mm. long, broader than long; first flagellar segment 0.46 mm. long; second flagellar segment 0.57 long $\times$ 0.24 mm. in diameter.

Alitrunk testaceous, moderately coarsely and quite completely, closely sculptured, with a moderate vestiture of simple to subplumose white hairs. Pronotum dorsally with contiguo-confluent, moderately coarse, moderately shallow puncturation, but the lateral faces plane, largely impunctate (except for microscopic setigerous punctulations), nitid, anteriorly margined by a delicate humeral vertical carinule; epaulets quite distinct on humeri and lateral corners. Mesoscutum with quite coarse, distinctly separated to widely separated, sharply defined, deep, circular, setigerous punctures, the flat intervals nitid; notaulices unusually well developed (for *Odontophotopsis*), complete but shallow and obsolete about one-fourth from anterior margin of scutum; scutellum and axillary lobes with contiguo-confluent, coarse, more shallow sculpture than

scutum. Mesopleura with anteroventral regions, and a large area above middle coxae and along metapleural border nitid and impunctate, except for scattered, microscopic, setigerous punctulations; oblique furrow well-developed, broad, gutter-like, nitid and impunctate, the coarsely and contiguously punctured dorsal and posteroventral regions of mesopleura therefore separated and not confluent. Mesosternum largely obscurely rugose, not clearly punctate except near mesopleural borders, somewhat shining, armed at anterior border of the swollen posterior half with a pair of very large, sharp, tapering, closely approximated spur-like processes, the sinus between the spurs very narrowly V-shaped (width at apex much less than height of processes) ; anterior face of processes vertically declivous, posterior faces somewhat gradually fused with mesosternum and less swiftly declivous. Metasternum with

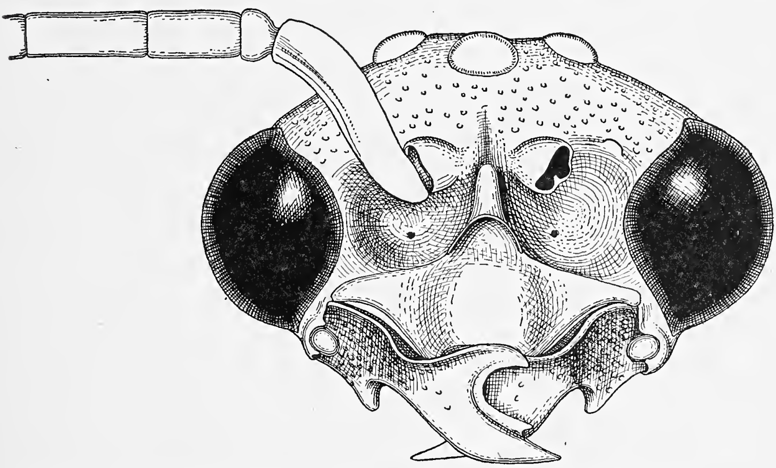

Fig. 1. *Odontophotopsis biramosa,* type; frontal view of head.

a rather high, transverse, anterior ridge between and in front of hind coxae, produced at each end into a low tooth, but not distinctly dentiform medially. Propodeum coarsely reticulate with moderately deep reticulations, at base somewhat more coarsely areolate-reticulate, but without trace of a pair of rectangular areoles; lateral propodeal faces similarly, but less coarsely reticulate almost to the anterior margin, merely a narrow, anterior, propodeal border nitid and flat; the propodeal sculpture therefore not extending onto metapleura (the latter nitid and impunctate, except for about six coarse, reticulate punctures on lower portion, which

are distinctly separated by a nitid gutter from the propodeal sculpture). Legs quite unmodified, stramineous to concolorous with body, with moderate white vestiture; calcars 1–2–2, scarcely paler than legs. Wings hyaline, with yellow veins and stigma; stigma 1.12 mm. long, moderately small; marginal cell relatively large, acute distally, 1.50 mm. long on costal margin; cell R_5 irregularly pentagonal-rectangular, obliquely truncate distally, 1.10 mm. long; distance of stigma from bifurcation of $R+M$ 0.75 mm.

Gaster concolorous with alitrunk, testaceous. Petiole moderately nodose and rather slender, moderately constricted dorsally at apex, dorsally with moderate, separated, setigerous punctures, laterally and basally with contiguous to confluent, moderately coarse puncturation; apex with a thin fringe of plumose decumbent hairs, otherwise with pilose, erect, sparse, simple hairs. Tergum two with disk highly polished, distantly, setigerously punctulate, the base and lateral margins with moderate, slightly distant to close, setigerous punctures; at apex closely, setigerously punctate and punctulate, with a dense band of plumose hairs. Sternum two at base with a short, subtectate, longitudinal keel, the basal third elsewhere coarsely, closely punctate to rugose-punctate, the distal half or more with progressively more widely spaced and smaller setigerous punctures, highly polished; apical band of plumose hairs well developed; sublateral felt lines reduced to minute tufts, less than 1/10 the length of tergal felt lines. Segments 3–6 with apical thick fringes of plumose hairs and sparse, erect, pilose, simple hairs, all white, arising from minute, scattered punctures, between which the distinct intervals are faintly shagreened. Pygidial segment with a basal "band" of close, setigerous punctures, narrowed and interrupted medially (thus reduced to two lateral triangular regions), the integument elsewhere nitid, impunctate, except for apical and subapical fringe of minute setules arising from distal band of minute punctulations, a laterally defined pygidial area therefore absent. Hypopygium elongate, narrowly triangular, narrowly rounded at slender apex, slightly convex and rounded laterally, the disk with widely spaced, minute, setigerous punctures becoming slightly closer and coarser laterally.

Holotype: Holtville, California. July 2, 1929 (Paul W. Oman), in collection of United States National Museum.

This unique species is closely related only to the following species, *O. setifera.* It shares with that species a biramose mandibular apex, and a strong ventral incision (and subtending tooth). A similar biramose mandible does not recur again anywhere

among North American Mutillidae. Other diagnostic characters are the large, closely approximated anterior mesosternal spurs (much as in the species of the *O. inconspicuous-venustus* group), the modified mesopleura, with the oblique furrow very broad and well-marked, highly polished, the virtually complete notaulices, and the minute, tuft-like felt lines of the second tergum. The small stigma, elongate marginal cell, the carina of the base of the second sternum, and the nitid, undefined pygidium are also strongly differential characteristics; all shared with the next species.

The species differs from *setifera* at once in the sharply elevated, slightly hood-like produced dorsal median base of the clypeus, and in the lack of a short, stiff, equally long, brush-like vestiture of the clypeus. The ventral half of the mandibular apex is also merely bidentate: no small, third tooth being evident (in *setifera* clearly tridentate obliquely, hence with four mandibular apical teeth). In *biramosa* the mesosternum has the simple processes separated by a narrow sinus, much narrower than the height of the processes; in *setifera* the processes are separated by a broadly U-shaped sinus, much wider than the processes are high, and there is, in addition, a small spur immediately behind each of the large anterior spurs (i.e., the mesosternum is quadrispinose). There are numerous other differentiating characters of a minor nature, and the two species are clearly abundantly separated by many characters, being allied chiefly by the very anomalous mandibular form.

Odontophotopsis (O.) setifera n. sp.

Male: Length 14 mm. Integument uniformly pale-testaceous, with a moderately dense vestiture of white simple and plumose hairs.

Very similar in facies and general characters to *O. biramosa*. The head transversely rectangular-rounded (excluding the strongly bulging eyes), the vertex behind the eyes subparallel and scarcely convergent for a short distance, then rather swiftly rounded into the slightly arched, subtruncate posterior aspect of the head; integument highly polished, distantly setigerously punctulate, the front with the punctulations no coarser, scarcely less distant than on vertex. Head width 3.05 mm.; width of vertex immediately behind eyes 2.56 mm.; length of head from interantennal sinus to occipital ridge 2.12 mm.; vertex behind eyes 1.00 mm. long. Eyes extremely large and strongly bulging, 1.13 mm. long, shortly ovate; front between eyes 1.60 mm. Ocelli large, bulging, the length of posterior 0.41 mm.; ocellocular distance

0.56 mm.; interocellar distance exactly equal to ocellocular distance; distance to anterior ocellus 0.23 mm. Clypeus anomalous, the entire posterior two-thirds obscured by a dense "beard," formed of short, stiff, abruptly terminated (and almost clavate) seta, forming a dense brush; clypeal base elevated obscurely, medially as a rounded low tubercle slightly higher than the front behind it, almost hidden by the dense setose vestiture; clypeus strongly anteriorly declivous, in front of basal tubercle, strongly depressed below dorsal mandibular rims and forming a deep basin with them; anterior part of clypeus drawn out as a narrowly trapezoidal, prominent median lobe, narrowly truncate-retuse at apex, and only 0.50 mm. wide at apex, the corners of the truncation spiniform, acutely produced; anterior clypeal lobe with a distal row of setae, forming a slight beard of sparse, long, arched setae, otherwise nearly impunctate and nitid (in strong contrast to the densely setose region posterior to it). Mandibles as in *biramosa,* but the ventral branch of the apex distinctly tridentate: thus the mandible quadridentate distally. Antennae and antennal scrobes identical with those of *biramosa.*.

Alitrunk as in *biramosa,* the lateral pronotal faces similarly plane, even more polished and less punctulate, delicately margined anteriorly. Mesopleura even less coarsely sculptured, and with sculpture more restricted; the entire anterior halves, except for dorsal limited region, nitid, flat, almost impunctate (except for sparse, scattered, minute, setigerous punctulations) ; oblique furrow broad, not very deep, quite distinct; limited dorsal area and posteroventral region (on inflated part of mesopleura), with moderately coarse, rather regular punctures, much less coarsely sculptured than in *O. biramosa.* Mesosternum anomalous: the anterior processes slightly less strong than in *biramosa,* not closely approximated (separated by a broadly U-shaped sinus distinctly wider than processes are high), the large anterior processes each with a smaller spur directly behind them. Scutellum with the round, contiguous punctures much smaller than in *biramosa.* Propodeum reticulate, with four moderate basal areoles conspicuously larger than surrounding reticulation; reticulations so oriented as to form a sharp row on each side, separating dorsal from lateral faces, the longitudinal ridges forming a more or less distinct longitudinal carinule on each side; lateral propodeal faces therefore rather distinctly separated from dorsal; lateral faces with sculpture limited, bearing only a single row of reticulations, adjacent to posterior face, the reticulations rather small, not extending near to meta-

pleural border, a large, broad anterior portion of lateral faces nitid, flat, impunctate, continuous with the nitid metapleura (which lack all but a few vestigial punctures that occur ventrally). Legs as in *biramosa.* Wings as in *biramosa,* but stigma larger (compared with distance from bifurcation of R + M); stigma 1.35 mm. long; distance from bifurcation of R + M 0.50 mm. (merely 0.37 length of stigma); marginal cell elongate, acute distally, 1.65 mm. long on costal margin; R_5 rectangular-pentagonal, 1.30 mm. long.

Abdomen as in *biramosa,* but petiole subsessile, scarcely constricted distally and much broader, less closely punctured (dorsally with distinct, ill-defined punctures), at apex with fine plumose pubescent band; second sternum very distantly, finely punctulate, highly polished, except laterally, where with distant coarser punctures, the base unusually weakly punctulate and nitid; median part of base with a tectate short keel; lateral felt lines short but conspicuous tufts. Hypopygium with central part of disk impunctate, nitid, the distal part of lateral margins with a group of close, setigerous punctures, bearing a small tuft of brownish, stiffly setose hairs.

Holotype: Palms to Pines Highway, Riverside County, California, 1,000 feet elevation, May 28, 1940 (Bohart), in collection of author.

Paratype: Ehrenberg, Arizona, April 29, 1939 (F. H. Parker), in collection of University of Minnesota.

This species is anomalous in the biramose, quadridentate mandibles, and in the brush-like development of the clypeal vestiture. The two characters at once separate the species from all other North American Mutillidae. The mandibular form allies it to *biramosa,* in which the lower branch of the mandibular apex is only bidentate (clearly tridentate in *setifera*), and in which the clypeus is very different (compare descriptions). Other features that separate *setifera* from *biramosa* are: 1) the quadridentate mesosternal armature, with the distance between the processes of each side much greater; 2) the very weakly punctulate base of the second abdominal sternum of *setifera;* 3) the tuft of brownish, long, stiff setae of the lateral corner of the distal portion of the hypopygium; 4) the largely reduced sculpture of the lateral propodeal faces; 5) the larger stigma, compared to the distance from bifurcation of R + M; 6) the more distinct sternal felt lines. Other differences are cited under *biramosa.*

AN APPROACH TO SPECIALIZING.

By Rowland R. McElvare, Port Washington, Long Island, N. Y.

After a person has collected generally in entomology and has acquired some familiarity with the various orders, he usually decides to continue in that order which has had a particular attraction for him. This in itself is usually a large field. Presently he accumulates an unwieldy mass of material, regarding which he has only a superficial knowledge. Looking ahead, he sees that further activity on his part will aggravate this situation if he can devote only limited time and resources to its pursuit. The time has arrived when the possibilities of specializing should be examined.

Entomology has, of course, many aspects that lend themselves to special study, such as distribution, life histories and migration, for example. Below is suggested an approach to the study of all aspects of a limited group of Lepidoptera. This approach can readily be applied to other orders.

Selection of a group for study should be made only after careful consideration and consultation with men of broad experience, such as teachers of entomology and museum experts. There is probably no group in which valuable work cannot still be done, but some groups have been neglected and may offer greater opportunity for original work. However, the reasons why they have not been worked up may be significant and should be clearly understood and acceptable before going ahead. For practical reasons, the size of a group should be limited. One that is too large may become burdensome. If a small one is worked up, on the other hand, it is always possible to turn to another. About two hundred species, more or less, is suggested as a practical limit for intensive study.

One of a specialist's first requisites is ability to recognize his species and to know when and where they are to be found. To recognize them accurately with confidence, the original descriptions should be consulted. To be sure some of the older descriptions may merely say "a pretty little pink moth from North America", but generally speaking they tell what the author saw that was different from related species. Unfortunately these original descriptions are usually scattered through numerous journals which may not be available for purchase. They can, however, be copied in entomological libraries. At this point, the advantage of working with some two hundred instead of several thousand species becomes readily apparent. The specialist, by limiting the scope of his

studies, can do with facility essential jobs which become impractical to the average worker when attempted on a vast scale.

As a start, Dyar's Check List of N.A. Lepidoptera will supply references to the original descriptions. References to new descriptions since it was published in 1902 must be sought elsewhere. In addition to the description, it is essential to locate the type of each species. An inspection of the names of the authors listed after the species in McDunnough's Check List is often a clue to the collection in which the type was deposited. Ultimately, the specialist will want to have in his study collection a specimen compared with the type of each species. Insofar as possible he should make this comparison himself as a matter of education. When types are domiciled abroad or in distant collections, he may have to be content with a good photograph, if available, or comparison with a specimen that has been compared with the type, which is not too satisfactory.

For successful collecting and field study, data are required on when and where the insects fly. This involves visiting collections having a substantial representation in the group and taking off the records from the labels. Valuable information on the distribution and season of flight recorded over many years may be readily obtained in this way with a little effort. In some museum collections may also be recorded the domicile of the type and the reference to the original description. Because of the great importance of museums as depositories of types and sources of data and study material, it seems appropriate that specialists help fill in the gaps in museum collections, from time to time, as they accumulate material for study. Museum collections are usually available to anyone seriously interested and the curators are more than willing to assist with advice and suggestions. It is well to remember that they are also busy men who cannot be expected to do a specialist's research for him.

When the specialist has assembled the information tools referred to above, he is prepared to face his fundamental problem—the insects. After all, they are what he set out to study, although sometimes students seem reluctant to graduate from the literature to the insects themselves. The literature is only a tool, although an important one. Presumably it is incomplete because the group would not be selected for study if the last word had been spoken. In some particulars, the literature may not always be entirely accurate, for a variety of reasons. In any case it affords a base from which to start.

Considerable material for study may be acquired in the usual way, by purchase, exchange or loan. A substantial amount of it should be obtained at first hand in the field. This is the only way to build up accurate knowledge of habitat, food plant, and the many special characteristics that the general collector does not have the time or the interest to record. Field collecting also is often the only way the specialist can obtain the extended series of specimens he requires for many of his studies, after he has discovered that a few specimens showing variation do not necessarily constitute a new species. While it is interesting to discover new species, the really important job is to learn something new about species, many of which have been represented, for generations, by names in the check list and little else. How well this can be done is admirably demonstrated by the work of such specialists as Henry Bird in the Papaipema and Dr. Frank Morton Jones in the Psychidae.

Specializing offers to collectors an opportunity for rewarding study and constructive accomplishment within the limits of time and resources available. It would be a fine thing if more of them would try it.

NOTES ON NORTH AMERICAN MUTILLIDAE II. SOME NEW SPECIES OF THE GENUS PHOTOMORPHUS.

By Rudolf M. Schuster, University, Mississippi.

The following new species which the writer would assign to *Photomorphus* Viereck are published at this time in order that the names be properly validated for use in a morphological and phylogenetic discussion in Part II of a revision of "The Sphaeropthalmine Mutillidae of America North of Mexico." The utilization of the generic name *Photomorphus* is considerably different here than it has been in previous papers on this group. The species here assigned to *Photomorphus* would have been assigned in previous works to *Odontophotopsis.* The reasons for these changes in generic concept and circumscription will be discussed in detail, in Part II of the aforementioned revision.

Photomorphus (Photomorphina)[1] **aurifera** n. sp.

Male: Length 10 mm. Integument of body ferruginous throughout, that of head and alitrunk deeper than on gaster (the latter orange-ferruginous); antennae and legs, including coxae and trochanters, dark fusco-castaneous to blackish. Vestiture of head and alitrunk pilose, long, erect, simple and subsimple, rather thin and sparse, except for mesoscutum, which has suberect, shorter, stiffer, fuscous to chocolate-brown vestiture; gaster white pubescent near base, but terga 2–8, sterna 3–8 golden to orange pubescent (on distal terga somewhat more golden-fuscous).

Head rectangular-subquadrate, parallel for a rather considerable distance behind eyes, then rather swiftly rounded into the subtruncate, slightly rounded, posterior aspect of head, the head thus quite rectangular behind in dorsal profile, and the temples quite full; front and lower vertex with rather coarse, contiguo-confluent, somewhat irregular puncturation, subrugose, the upper vertex becoming slightly less closely, but equally coarsely punctured and obscurely rugose; genae with close, equally coarse puncturation, the punctures extending onto postgenae and there becoming distant and scattered mesally. Head width 2.05 mm. (1.90 width of front between eyes; 1.08 width immediately behind eyes); width im-

[1] *Photomorphina,* new subgenus, differs from typical *Photomorphus* in the unarmed mentum and tridentate mandibles; it will be described in detail shortly, in another connection. Type, *P. aurifera,* n. sp.

mediately behind eyes 1.90 mm. (the eyes little protuberant); length of head from interantennal sinus to occipital ridge 1.58 mm.; vertex length 0.79 mm. Eyes moderately large, moderately or little protuberant, black and highly polished, 0.76 mm. long; front between eyes 1.08 mm. (1.42 eye-length). Ocelli moderately large, 0.27 mm. long; ocellocular distance 0.51 mm. (1.88 ocellar length); interocellar distance 0.39 mm.; distance from anterior ocellus 0.19 mm. Clypeus polished, nitid, impunctate, except for anterior margin, slightly depressed to form a very shallow basin, at median base elevated into a rounded, rather small tubercle, at the anterior margin slightly elevated at a transverse, retuse, setigerously punctate and hirsute truncate border (0.25 mm. wide), the region between base and apex with fine, scattered, setigerous punctulations, the hairs small, inconspicuous; median truncate lobe short, poorly developed, obtusely angulate at corners and not tuberculiform-produced. Mandibles moderately strongly dorsiventrally dilated, with complete dorsal carina, scarcely forming blade-like rims, ending in dorsal mandibular teeth; basal portion with broad, densely, rugosely setigerously punctured, outer face, ending in a large rounded, obtuse subasal tooth (length to apex of tooth 0.40 mm., width 0.37 mm. at tooth); width at incision merely 0.19 mm. on external face (about half width at tooth), the mandible distad of excision again somewhat, but not very strongly dilated, attaining a subdistal width of 0.31 mm., the distal portion of mandibles with very sharp ventral carina, ending in the large ventral tooth; mandibular apex obliquely terminated, the dorsal tooth large, the middle, third tooth, vestigial. Mentum sharply, longitudinally tectate, except for basal and apical ends, the keel sharp, almost blade-like, somewhat arched in lateral profile. Antennae deeply fuscous, including the scapes; scapes closely hirsutely punctate, with obscure ventral carinae; pedicel 0.19 mm. long and wide; first flagellar segment 0.37 mm. long; second flagellar segment 0.40 mm. long $\times$ 0.20 mm. wide. Antennal scrobes armed above with a sharp, rather obvious thorn, but with the suprascrobal ridges obscure.

Alitrunk rather deep ferruginous, closely and coarsely punctured. Pronotum closely, contiguously to contiguo-confluently punctured, both dorsally and laterally, the posterior margins of the lateral faces with the punctures longitudinally confluent, forming rugae; humeral epaulets inconspicuous, lateral epaulets vestigial. Mesoscutum and bases of tegulae with relatively coarse, suberect to subdecumbent, fuscous hairs; mesoscutum contiguously, coarsely, rather deeply punctured like dorsal pronotal face, with parapsidal furrows discrete only on posterior three-fifths of scutum; scutel-

lum slightly less coarsely, but quite confluently punctured. Mesopleura with rather close and coarse, but distinctly separated, round punctures over most of the faces, with a small area above the middle coxae adjacent to metapleura, and with anteroventral, flat region virtually impunctate, nitid (except for fine, inconspicuous microsetigerous punctulations); oblique furrow weak, slightly indicated, coarsely punctured (the dorsoanterior and posterolateral punctured regions thus widely confluent). Mesosternum similarly punctured as adjacent inflated mesosternal region, the punctures becoming small, less regular towards middle, the area adjacent to median furrow with obscure transverse, scattered rugosities, posterior to the armature; armature about midway between anterior mesosternal margin and base of middle coxae (i. e., at anterior margin of the swollen, posterior portion of mesosternum), consisting of a pair of rather low, closely approximated, apically obtuse, peg-like processes, sharply declivous anteriorly and mesally moderately sharply declivous posteriorly and laterally, the pegs perhaps slightly transverse, but not dentiform, their apices each with a transverse setigerous crease (thus bidenticulate in lateral profile); sinus between processes narrowly U-shaped. Metapleura with upper edge of dorsal plates closely setigerously punctured, the puncturation continuous with that of propodeum, the lower portion smooth except for dense, microsetigerous punctulations; lower metapleural plates nitid and smooth, except for small area above hind coxae that bears a few coarse punctures, and except for fine, scattered microsetigerous punctulations. Propodeum with relatively close-meshed reticulations dorsally and posteriorly, the reticulations becoming even narrower at lateral edges, extending onto narrow lateral faces, except for a narrow anterior strip adjacent to metapleura, that is nitid and impunctate (except above); dorsal base with a pair of very small basal areas. Mesosternal transverse process moderately developed, with a small, posteriorly declivous median tooth, in addition to the normal, triangular lateral teeth. Legs fuscous throughout, including coxae and tarsi; middle coxae closely approximated medially; calcars ivory-white. Wings very lightly infuscated, especially distad of the region with closed cells, and along anal margin of fore-wings, opposite the stigma; stigma blackish-brown, small, 0.34 mm. long; marginal cell narrow, quite elongate, acute distally, 0.60 mm. long on costa (nearly twice as long on costal margin as stigma).

Gaster with integument orange-ferruginous; petiole stout, rather short, but distinctly constricted dorsally and laterally at juncture with second segment, subnodose; laterally closely, contiguously

punctured, dorsally with punctures more distant and with variable nitid intervals, with erect, sparse, pilose silvery hairs. Tergum two with disk centrally nitid with distant, but rather coarse, setigerous punctures, laterally and basally with the punctures closer, but scarcely contiguous; with long, pilose orange hairs, except for narrow basal and lateral strips, which have white hairs, and for felt lines, which are white; at apex with a few hispid hairs, but no discrete plumose vestiture, the entire apical fringe orange. Second sternum punctured like tergum, not distinctly more coarsely so, with sparse, decumbent white hairs, except for median part of apical fringe, which is faintly orange tinged; felt lines half as long as those of tergum. Terga 3–7 with orange to orange-fulvous bands of simple vestiture, the hairs erect, rather long, forming distinct fringes; sterna 3–5 with a few pilose, erect hairs silvery, the other vestiture of sterna 3–8 pale to distinctly orange tinged. Pygidium with a broad basal, complete band of contiguous, rather coarse, setigerous punctures bearing suberect, long, orange-fulvous hairs, beyond which there is a distinct, laterally elevated and defined pygidial area, orbicular-quadrate in shape, whose disk is rugulose-granulose and bears, except for lateral margins, a distinct vestiture of short, stiff, decumbent, rather inconspicuous hairs. Hypopygium nearly flat, rounded-apiculate distally, the disk with distant, setigerous punctures, becoming closer and coarser marginally.

Holotype: Douglas, Arizona, July 18, 1933 (W. W. Jones), in collection of University of Minnesota.

Paratypes: Douglas, Arizona, Sept. 25, 1932 (W. W. Jones), in collection of author; Tucson, Arizona, July 30, 1937 (F. H. Parker), in collection of University of Minnesota.

This distinctive species is relatively brilliant, because of the bright body colors and orange vestiture of the gaster. It is allied most closely with two other species that have mesosternal processes that are peg-like (i. e., rather suddenly elevated as more or less terete knobs or tubercles, supplied with a dorsal transverse crease), namely *P. clandestinus* (Vier.) and *P. imperialioides* sp. n.[2] The species differs from *clandestinus* in the blackish legs and antennae, in the orange vestiture of abdominal terga 2 or 3–8 (white, except at most on segments 5–7, in *clandestinus*, and in the lower, less obviously terete and peg-like mesosternal processes.

[2] The description of this species will appear shortly in another connection.

(To be concluded in the June issue)

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CONTENTS

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NOTES ON NORTH AMERICAN MUTILLIDAE II. SOME NEW SPECIES OF THE GENUS PHOTOMORPHUS.

By Rudolf M. Schuster, University, Mississippi.

(Continued from the April issue)

The species differs from *imperialioides* sp. n. at once in the unicolorous integument of the body, in the virtually totally orange vestiture of the gaster, in the somewhat smaller ocelli, (0.53 the ocellocular distance; 0.64 in *imperialioides*), in the smaller, less protuberant eyes, with a total head width 1.1 or less the width immediately behind eyes (1.16 in *imperialioides*). The species is extremely close to *imperialioides,* except for the unicolorous integument, and shares with it the mandibular form, the clypeal form, the close, coarse puncturation of the head (especially of the front), and the black pigmentation of antennae, including scapes, and of the legs, including coxae, as well as the similarly carinate and arched mentum.

A further difference appears to occur in the relative size of the eyes, vs. width of ocellocular distance. In *aurifera* the eye-length is merely 1.50 the ocellocular distance (indicating relatively small eyes), while in *imperialioides* it is 1.85–1.9 the ocellocular distance (indicating relatively large eyes, and showing an approach to the related *P. clandestinus*).

Photomorphus (Photomorphina) juanita n. sp.

Male: Length 10 mm. Integument of body nearly uniformly ferruginous, that of head and alitrunk rather deep ferruginous (becoming blackish-red on venter of alitrunk), that of gaster orange-ferruginous; legs and antennae totally fuscous or fusco-castaneous to base, including coxae and scapes; vestiture whitish and suberect or erect, except mesoscutum and bases of tegulae with fuscous, more decumbent hairs, and abdominal terga 5–8 and sterna

6–9 with orange tinted hairs (entirely or in part): sculpture coarse and close, especially on head and dorsum of alitrunk. Wings rather strongly pictured, hyaline except for a fuscous cloud in region of cross-vein *m* and posterior to marginal cell, in fore-wings.

Head transversely rounded-rectangular, rather short behind the large, black, polished eyes, very coarsely, closely punctured: on front with punctures strongly confluent, especially transversely, thus somewhat transversely rugose-punctate, on the vertex becoming less sharp, slightly or obscurely separated; on genae with coarse but rather shallow, ill-defined, contiguous puncturation; vestiture entirely white; erect or suberect, sparse, moderately long. Head width 2.17 mm. including eyes, 1.92 mm. immediately behind eyes; head length (from interantennal sinus to occipital ridge) 1.47 mm.; length of vertex behind eyes 0.75 mm.; vertex rather short behind eyes, parallel behind eyes for an extremely short distance, then broadly, evenly rounded into the weakly arched and rounded posterior aspect: thus with temples quite poorly developed. Eyes black, rather strongly protuberant, highly polished, 0.78 mm. long; front between them 1.13 mm. (1.45 the eye-length). Ocelli rather large, length 0.29 mm.; ocellocular distance 0.50 mm. (1.72 ocellar length); interocellar distance 0.42 mm.; distance to anterior ocellus 0.19 mm.; ocellar region concolorous with rest of cranium. Clypeus quite moderately depressed, forming a basin with mandibles, obscurely elevated as a vestigial rounded basal tubercle bearing a few setigerous punctulations, anterior to which it is declivous and somewhat concave; anterior margin truncate-retuse medially, with an arched subapical border that is densely setigerously punctate, 0.25 mm. wide; lateral areas, laterad of median truncation narrowly, closely setigerously punctate; clypeus nitid and impunctate elsewhere. Mandibles moderately strongly dilated, the dorsal rims complete and sharp, ending in inner (dorsal) tooth, thus with complete, rather broad, basally coarsely, setigerously punctate external faces; mandibles ventrally with a slight, sharply produced and acute angulate tooth, but scarcely excised beyond (the width before and beyond tooth not differing greatly); basal portion 0.38 mm. long to apex of ventral tooth; width at tooth 0.30 mm.; width at narrowest point just beyond tooth 0.23 mm.; mandibles scarcely dilated beyond excision, remaining subparallel, except that the ventral margin is distally sublamellately produced as a sharp, knife-like ventral, dilated margin (there 0.26 mm. wide); mandibular apex obliquely tridentate. Mentum sharply longitudinally carinate, except anteriorly, the carina blade-like, arched in profile, but not angulate or dentiform. Antennal scrobes with a moderate, but low

and broad tubercle above, with no trace of suprascrobal ridges; scapes fuscous like flagellum, coarsely closely setigerously punctured and with a rather poorly developed longitudinal carinule on distal half of interior face. Pedicel 0.17 mm. long; first flagellar 0.30 mm. long; second flagellar 0.38 mm. long × 0.20 mm. wide.

Alitrunk deep ferruginous, especially ventrally, closely coarsely sculptured. Pronotum dorsally coarsely, contiguo-confluent punctured, laterally with a few shallow, ill-defined, partially confluent punctures, the intervals and impunctate regions finely, setigerously micropunctate; humeral and lateral epaulets both moderately distinct. Mesoscutum coarsely contiguo-confluently punctured, slightly more coarsely so than pronotum, with notaulices obsolete, distinct only on posterior one-fourth of scutum (circa as long as parapsidal furrows); vestiture subdecumbent, fuscous. Mesopleura coarsely, closely to confluently punctured, on the ventral swollen region with the punctures extremely large, rounded, shallow; anteroventral region nitid and impunctate, except for scattered setigerous punctulations; oblique furrow obsolete, the coarsely sculptured dorsal and ventral regions broadly confluent; limited area above middle coxae nitid and impunctate. Mesosternum armed at anterior border of the swollen, posterior half with a pair of peg-like, prominent, closely approximated processes, separated by a narrowly U-shaped sinus (the arms of the U somewhat connivent); processes almost vertically declivous on all sides, except their external borders, armed apically by a transverse, setigerous crease (thus bidentate in lateral profile), in ventral view slightly but distinctly wider than long and thus somewhat proximodistally compressed, though not strongly transverse. Metapleura nitid, impunctate (except for a few coarse, obscure punctures ventrally), but with scattered microscopic punctulations bearing a decumbent, fine puberulence. Metasternum with a rather high, but narrow bidentate median process. Propodeum with rather deep but quite close-meshed reticulations, except basally, where with a pair of median longitudinal areas formed by coalescence of 4–5 reticulations each; reticulation becoming narrower laterally, the lateral faces coarsely punctate-reticulate, the sculpture not quite extending to anterolateral borders, which are impunctate adjacent to metapleura. Wings nearly hyaline, with dark brown veins and black stigma, the lamina locally clouded in region of vein *m*, and in central part of distal fourth of wing; stigma 0.76 mm. long, marginal cell on costa 1.10 mm. long; R_5 narrowly rectangular-polygonal, 0.90 mm. long. Legs castaneous black, including coxae, with ivory-white calcaria; coxae and trochanters unmodified.

Gaster moderately punctured, the second segment more coarsely so, orange-ferruginous. Petiole rather broad and stout, only slightly constricted distally, subsessile, moderately coarsely, closely (laterally contiguously punctured), the punctures dorsally coarser, slightly separated, the punctures nowhere sharply defined, rather shallow. Tergum two with a restricted central disk highly polished but with scattered, widely separated, shallow, ill-defined, rather coarse setigerous punctures, the puncturation becoming closer but scarcely coarser laterally, and becoming much coarser, contiguo-confluent and rugose basally; lateral felt lines very long, the surrounding region punctate but not punctulate; lateral narrow rims nitid, virtually impunctate and lacking setigerous punctulations. Second sternum similarly, but more coarsely, centrally more closely punctured, the entire basal half with contiguous to confluent, coarse rugose sculpture; felt lines rather short, circa two-fifths those of the tergum in length, the surrounding region closely punctured but not setigerously punctulate. Segment two entirely with white pubescence, but that of tergal disk somewhat yellowish-stained; segments 1–3 white pubescent dorsally and ventrally; terga 4–8 golden-yellow to orange pubescent, the apical margins of terga 2–4 furthermore with an inconspicuous band of decumbent, subplumose hairs. Sternum 2–3 white pubescent; sternum 4 laterally, and sterna 5–9 totally yellowish to golden pubescent. Sterna and terga 3–7 rather closely, but finely punctured, except for narrow basal rims. Pygidium with a broad basal band of close, rather fine, setigerous punctures, bearing a rather thick orange fringe of hairs, the distal three-fifths of segment with a subquadrate pygidial area defined laterally by carinules, the disk dull, shagreened, the apical one-fourth to one-eighth with a fine vestiture of short, decumbent hairs. Hypopygium flat, elongate, rounded-mucronate at apex, the disk with scattered setigerous punctures.

Holotype: McAllen, Texas, July 2, 1938 (R. I. Sailor), in collection of United States National Museum.

Paratype: Brownsville, Texas, June 2, 1932 (E. G. Linsley), in collection of G. E. Bohart.

This species is superficially very similar to *P. aurifera:* sharing with it the combination of deep ferruginous head and alitrunk, and orange gaster, the same essential pubescence pattern (white vestiture, except for fuscous hairs of mesoscutum, and for the orange vestiture, of the distal abdominal segments), the same, peg-like mesosternal processes, and identical, coarse and close punctu-ration, a sharp, almost blade-like ventral lamella of the distal

portions of the mandibles, and a dull, granulose distal pygidial region. The most obvious difference lies in the mandibles: in *juanita* these are scarcely interrupted ventrally by a small, but sharp tooth, with a slight excision beyond; in *aurifera* there is a very large, rounded basal tooth, beyond which the mandibles are very strongly narrowed. In *juanita,* furthermore, segments 2–4 of the gaster are whitish pubescent, while only segments 5–8 are orange pubescent; in *aurifera* all the terga, including the second, bear orange pubescence. Finally, *juanita* has the wings hyaline, with localized clouds in the region of cross-vein *m* of the forewings, and of the region below the marginal cell—the wings being prominently, if not sharply, pictured; in *aurifera* the wings are nearly uniformly subfuscous, with the cloud in the region of *m* slightly distinct.

More closely related appear to be *P. minor* n. sp. and *P. mexicanella* n. sp., both of which share with *juanita* a carinate-produced mentum, and slightly ventrally armed mandibles. *P. minor* differs at once in the very slight, obsolete sculpture and the pale legs and antennae. *P. mexicanella* also differs in the pale legs and antennae, but also has much smaller ocelli, and a sharply armed clypeal base. The descriptions of these two species bring out other salient differentiating characters.

Photomorphus (Photomorphina) mexicanella n. sp.

Male: Length 6 mm. Extremely similar to *P. juanita* morphologically, but with clypeus distinctly armed basally, and with sculpture merely moderately coarse and moderately close. Orange-testaceous throughout, the antennal flagellum slightly fuscous; legs concolorous but not stramineous; vestiture uniformly white and sparse, except that of mesoscutum and of terga 5–8 and sterna 6–8 more or less fuscous tinged. Wings hyaline.

Head rounded obtrapezoidal, with moderately coarse, round, rather ill-defined, punctures, slightly separated to moderately separated on front, more distant on vertex and genae; head width 1.52 mm.; width immediately behind eyes 1.33 mm.; the vertex not at all parallel behind eyes, broadly and evenly rounded into posterior margin of head, the temples very poorly developed. Eyes rather large and protuberant, grayish, with facets distinct but not individually convex, 0.60 mm. long; front between them 0.83 mm. wide. Ocelli rather small, length 0.19 mm.; ocellocular distance 0.35 mm. (1.79 the ocellar length), interocellar distance 0.28 mm.; distance to anterior ocellus 0.16 mm. Clypeus as in *juanita*, but posteriorly strongly elevated, the elevation surmounted by a median basal, glabrous, strong, somewhat transverse tubercle, anterior to which it is strongly declivous; clypeus slightly concave, scarcely

depressed, forming a slight basin with mandibles, the anterior margins narrowly setigerously, finely punctate, especially on median lobe, where a subapical arched transverse ridge is rather densely hirsute, forming a moderate beard. Mandibles as in *juanita:* ventrally armed with a slight, little protuberant tooth, rather well developed, with complete sharp dorsal rims; basal portion (to apex ventral tooth) 0.30 mm. × 0.20 mm. wide at tooth; width at incision 0.15 mm. (0.75 width at tooth), the mandibles beyond incision slightly decurved but not or imperceptibly dilated, at apex with a sharp ventral, inferior lamellate carina, distally obliquely tridentate. Mentum with a sharp, tectately produced ventral, longitudinal carina on basal half, nearly flat on distal half. Antennae with distinctly yellowish scapes; flagellum slightly fuscous; pedicel 0.12 mm. long; first flagellar 0.23 mm.; second flagellar 0.29 mm. wide; antennal scrobes with distinct thorn, but with no indication of suprascrobal ridges.

Alitrunk yellow-testaceous. Pronotum rather coarsely punctate with slightly separated, round punctures, the sculpture obsolete, subrugose laterally; epaulets moderately distinct. Mesopleura largely nitid and impunctate: the sculpture confined to narrow dorsal border, where with coarse, contiguous punctures, and to limited area of swollen posteroventral region; entire anterior half, except dorsally, nitid and impunctate (except for a suggestion of microscopic, setigerous punctulations) and with a short but distinct, nitid oblique sulcus: the dorsal and posteroventral sculptured areas thus not confluent; posteroventral swollen area with a limited number of shallow, coarse, impressed, lenticular, round punctures, separated by narrow, distinct intervals; posterior margin, and area above middle coxae nitid and impunctate, except above, where sculpture attains metapleural border. Mesosternum laterally with the coarse, shallow sculpture extending onto it, elsewhere nearly impunctate; at midline, at anterior border of swollen posterior half, with a pair of approximate, peg-like processes, truncate at apex and with a single transverse, setigerous crease, the processes sharply declivious anteriorly and posteriorly, subterete, at best slightly broader than long. Metapleura nitid and impunctate, except for a few ill-defined, obscure punctures at ventral margins, fused indistinguishably with lateral propodeal faces. Propodeum shallowly, regularly, rather moderately reticulate, at base with a pair of elongate median areas about 4 reticulations long; reticulation extending moderately onto the lateral propodeal faces, becoming obscure anteriorly, a distinct strip adjacent to metapleura quite unsculptured, nitid. Legs concolorous

with body, yellowish, the calcars only a little paler. Wings subhyaline, except for the brownish veins and stigma: stigma 0.47 mm. long; marginal cell large, 0.75 mm. along costa; cell R_5 irregularly polygonal-rectangular, obliquely truncate distally, 0.58 mm. long.

Gaster yellow-testaceous throughout, moderately sculptured and very sparsely pubescent. Petiole subnodose, quite short and broad, but discretely, if weakly, constricted distally, laterally with small, obscure, shallow, ill-defined, but rather close puncturation, dorsally and posteriorly nearly impunctate, with a few shallow, vestigial punctures, highly polished on disk, with a few sparse, ill-defined, small, setigerous punctures; basal portion, except at lateral corners, similarly weakly punctured and polished; lateral margins with somewhat coarser and closer, but ill-defined punctures; felt-lines quite elongate. Sternum two with distal half, except laterally, highly polished, with rather distant, but relatively coarse setigerous punctures; basally and laterally with punctures coarser, closer to contiguous, ill-defined, setigerous; felt-lines slightly less than half as long as of terga. Distal segments finely, moderately punctured, the punctures distant to moderately separated, bearing a sparse, short vestiture; apex of tergum two with a few, vestigial, subplumose hairs, otherwise entire body with simple hairs only; vestiture entirely white, except for distal 3 segments, which have it entirely or largely, moderately fuscous tinged. Pygidial tergum with a narrow basal band of moderate, separated, setigerous punctures, narrowed and slightly interrupted medially, bearing a rather sparse vestiture of stiff, fuscous hairs; distal two-thirds forming a distinct, somewhat shagreened-granulose pygidial area, defined by elevated lateral margins, at distal border with a few short, decumbent, inconspicuous setules. Hypopygium flat, elongate, with a few scattered setigerous punctures on disk, the punctures contiguous along apical margin, close laterally.

Holotype: Purissima, Baja California, Mexico, October 1923 (W. M. Mann), in collection of United States National Museum.

This species is clearly allied to *juanita* sp. n. and *minima* sp. n., especially to the latter. It differs from both in the strongly elevated and tuberculate base of the clypeus, and in the fuscous vestiture of the distal abdominal segments. The much less coarsely sculptured and the shallow, impressed, lenticular punctures of the swollen regions of the mesopleura, the nitid oblique mesopleural furrow, as well as the yellowish legs and hyaline wings all separate it adequately from *juanita.* The very highly polished, almost impunctate petiole and disk and base of the second abdominal tergum are also very characteristic, and serve to separate the species from *juanita.*

These characters all serve to ally it to *minima,* in which the body colors are even paler, and the sculpture more reduced, shallow and ill-defined. The shallow, close-meshed reticulation of the propodeum, as well as the strongly tuberculate clypeal base will separate *mexicanella* from *minima.*

P. juanita, mexicanella and *minima* form a clearly related trio, agreeing in the peg-like, scarcely proximodistally compressed processes of the mesosternum, the ventrally only slightly armed and excised mandibles, the tectately carinate posterior (basal) half of the mentum, the rather moderate size of the ocelli, the presence of a pair of long basal propodeal areoles, the subsessile to subnodose, slightly distally constricted, closely punctured petiole, and finally, in the shagreened, dull pygidial area. Except for the mandibles, they are clearly related to *P. aurifera* and *imperialioides.*

Phyllaphis fagi L. in Utah: A slide of this aphid species recently was identified and called to my attention by Professor M. A. Palmer. I had collected an abundance of this material from dropping beech foliage present on and beneath a large tree on the L.D.S. (Mormon) temple ground at Logan, Utah on October 10, 1950. The insect injury condition was called to my attention by a gardner, who recognized that the early drop of leaves was due to the extremely heavy population of this aphid. He reported that the same thing had happened in the fall of 1949, when a similar severe aphid infestation existed. The grounds about this temple has trees and shrubs of many kinds which are uncommon to the area.—G. F. Knowlton, Logan, Utah.

Wanted: Brief notes from 4 to 30 typed lines to fill such blanks as this and others in this number and other numbers of the Bulletin.

TWO NEW SPECIES OF THYANTA STÅL (PENTATOMIDAE, HETEROPTERA).

By Herbert Ruckes, New York, N. Y.

In the process of preparing a revision of the pentatomid genus *Thyanta* Stål, examination of material from South America, Central America and the West Indies revealed a number of examples of undescribed species. These are being described now because the complete revision will not be finished for some time to come. Probably additional new species will be erected before the final monograph makes its appearance. Hemipterists who have attempted to study the species of this genus appreciate the difficulty of identifying and segregating them, due in many instances to the subtlety of many of their distinctive characteristics. Only after prolonged observation can the specialist be sure of the correct identity of the specimens he has at hand. In the following descriptions the characteristics are so sharply defined, however, that there should be little difficulty in separating each species from the other, and from forms already known.

Thyanta bimini n. sp.

Narrowly ovate, subdepressed, intermediate in size for the genus, bright yellow-green, darkening in preservation. Antennal segments I and II pale (sometimes lavender), III, IV and V bright green; segments II, III, and IV subequal, each a little longer than V. Surface of the head slightly convex, the margins before the eyes sinuate and converging to an acutely rounded apex at which the tylus is slightly longer than the juga. Ocelli exceptionally pronounced and somewhat protruding. Anterior two-thirds of the pronotum very weakly declivent, (not strongly demarked from the posterior third) irregularly and congestedly punctured but not conspicuously transverse rugose, very shallowly and vaguely impressed in the middle behind the cicatrices; no fuscous or black maculations at inner corners of cicatrices; humeri bluntly rounded, not at all produced or acutely spined; anterio-lateral margins before them quite straight, carinate or at least distinctly sharply angled; posterior third of pronotum more coarsely punctured and somewhat transverse rugose. Scutellum coarsely punctured, weakly transverse rugose on basal half, about one-sixth longer than wide at base, frenum reaching well beyond the middle, about three-quarters the distance to apex, the apical tongue with margins converging to a narrowly rounded apex. Hemelytra with punctures rather evenly

spaced, those on embolium slightly denser than on corium, no recognizable calloused points scattered over the surfaces. Membrane perfectly hyaline without maculations of any kind. Connexivum narrowly exposed, if at all, not alternated; apical angle of each abdominal segment rectilinear, not produced, and terminating in a very minute piceous point, visible ventrally as well. Abdominal venter with coarse, shallow, wide-spaced punctures, more numerous laterally; no post-spiracular points or spots. Tibiae and tarsi bright green to blue-green, femora usually paler and greenish. Rostrum relatively short, not extending beyond the hind coxae, bright blue-green, the terminal half of the last segment fuscous to black. Apical edge of the male hypopygium forming a very wide and flaring "V" with no median notch in it; lateral lobes slightly protruding and pubescent; heads of the exposed claspers (parameres) terminating in irregular rectilinear faces, which are somewhat pilose.

Described from 28 males and 41 females, all taken from South Bimini Island, a part of the Bimini Islands, 60 miles due east of Miami, Florida and belonging to the Bahamas, B.W.I. All but a few of these were collected by Charles and Patricia Vaurie.

HOLOTYPE: Male, 8½ mm. long, 4½ mm. wide across the humeri. South Bimini Island, August 10–20, 1951. Collected by Charles and Patricia Vauri.

ALLOTYPE: Female, 9 mm. long, 5 mm. wide across humeri. Same data.

PARATYPES: 27 males and 40 females, as follows:

Males: June, 1951 (2); July, 1951 (2); July 22, 1951 (2); Aug. 2–9, 1951 (7); Aug. 10, 1951 (2); Aug. 10–20, 1951 (3); Aug. 18–23, 1951 (9).

Females: June 6, 1950 (1) (Coll. Cazier & Rindge); June, 1951 (2); July, 1951 (1); July 20–31, 1951 (5); July 22, 1951 (4); Aug. 2–9, 1951 (11); Aug. 10–20, 1951 (8); Aug. 18–23, 1951 (8).

TYPES DEPOSITED—American Museum of Natural History.

This species is related to *Th. antiguensis* West, if relationship is based on similarity in composition of the male hypopygium and its contents. However, *Th. bimini* is about half again as big as *antiguensis,* being about the size of *Th. casta* Stål. Whereas the heads of the claspers (parameres) of *antiguensis* are widely exposed, subtriangular in shape and only sparsely pubescent, those of *bimini* are somewhat more obscured, subquadrangular in shape, with undulating edges, and are more strongly pilose. In the females the basal valves of the genitalia are much less tumid in *bimini* than

they are in *antiguensis*. *Th. bimini* lacks the contrasting color pattern of *antiguensis* and the piceous marking of the apical angles of the abdominal segments are much less conspicuous. The apical tongue of the scutellum in *bimini* is proportionately longer than in *antiguensis* and much more acute at its apex. The relative flatness of the pronotum shows a closer resemblance to *Th. casta* than any other known species.

Thyanta acuta n. sp.

General shape that of *perditor* and *cubensis* but somewhat smaller ($7–7\frac{1}{2}$ mm. long by $5–5\frac{1}{4}$ mm. wide) : color variable, a mixture of testaceous, green and reddish; the punctations rufous, less confused than in *perditor* and *cubensis* with no general transverse rugose pattern as in those species. Head about one fifth longer than wide between the eyes; margins before the eyes sinuate with the edges distinctly reflexed. Antennal segments II and III subequal, each a little shorter than IV (segment V is missing in both types) ; segments I, II, and basal half of III testaceous-green, remainder rufescent. Pronotum almost three times as wide as long; humeral spines prominent but less tapering than in *perditor,* pointing upward and laterally rather than forward, the lateral pronotal margins before them distinctly bent at about the mid-point somewhat as in *cubensis;* punctation of the pronotum distinct and more widespaced than in *perditor* with no rugose ridges between the punctures; a pair of black spots on the anterior disk, at the inner corners of the cicatrices; no transhumeral colored band or fascia but a pair of prominent square darker blotches on posterior disc of pronotum. Scutellum about as long as wide, weakly and vaguely transverse rugose, more so on the basal half, the punctures however more clearly defined than in *perditor;* frenum reaching only a little beyond the middle, the apical tongue quite long and obtusely rounded. Hemelytra with punctures well-spaced, deep and sharply defined, obsolescent or absent in the vicinity of the discal point, those on the embolium much denser and smaller than on the corium, no scattered pale calloused points present; membrane weakly maculated with brown or tan and reaching only a short distance beyond the terminal abdominal segment. Connexivum widely exposed, concolorous, testaceous to greenish, not alternated dark and pale; apical angle of each abdominal segment produced but not acute, black-tipped, this also visible ventrally. Venter with punctures scattered more laterally leaving a smoother almost impunctate

median area; basal angles of abdominal segments uncolored, only the apical angles black; apical angle of the sixth segment in the male obtusely rounded, somewhat as in *cubensis,* not acute as in *perditor;* a row of post-spiracular black points present but not conspicuous. Legs sparsely pilose, testaceous in color, tarsi darker; a distinct brown spot on the apical third of the anterior face of each femur. The exposed face of the male hypopygium distinctly concave, the ventral edge of the concavity delimited by a thickish lunate lip which is subtended by a band or brush of conspicuous pubescence; the lateral angles blunt, not produced; no median notch in the apical edge as in *perditor* or *cubensis.*

HOLOTYPE: Male, 7 mm. long; 5 mm. wide across humeri. Estancia Primera, Caa Guazu District, Paraguay, S. A. Dec. 23rd, 1931. Collected by Dr. R. P. Hussey.

ALLOTYPE: Female $7\frac{1}{2}$ mm. long; $5\frac{1}{4}$ mm. wide across humeri. Same data. Nov. 28, 1931. Collected by Dr. R. P. Hussey.

PARATYPES: None.

TYPES DEPOSITED: University of Michigan Museum.

This species shows close affinity to both *Th. perditor* (Fabr.) and *Th. cubensis* Barb. & Brun. It differs from the former principally by the absence of the transhumeral colored band, the presence of only a single black maculation at each abdominal incisure, the less rugose appearance of the dorsal surface of pronotum and scutellum, the bent anterio-lateral margin of the pronotum, and the laterally projecting humeral spine. It differs from *cubensis* by the presence of two black spots on the anterior disk of the pronotum, the shorter frenum, and longer scutellar tongue, the absence of the yellowish margin of the pronotum and more sinuate margins of the head. It differs from both these species in the composition of the male hypopygium, the brown maculations of the femora, and the pair of square dark patches on the posterior half of the pronotum.

EQUIPMENT AND METHODS FOR THE COLLECTION OF HIPPOBOSCID FLIES FROM TRAPPED CALIFORNIA VALLEY QUAIL, LOPHORTYX CALIFORNICA VALLICOLA (RIDGWAY), (DIPTERA).

By I. Barry Tarshis,[1] Berkeley,[2] California

Introduction[3]

For many years the problem of obtaining hippoboscid flies from birds has been a major stumbling block in carrying out research work with these flies. The literature is almost totally devoid of information on methods for collecting avian Hippoboscidae. As far as the writer has been able to ascertain, O'Roke (1930) and Herman (1944) are the only workers who have described techniques for taking these flies from birds. Both of these men worked with the Hippoboscidae of California quail.

O'Roke's method was to shoot the quail in an open clearing so that he could recover it quickly, before the escape of the flies from the quail. The bird was placed in a conical gauze bag which was then suspended with the apex of the cone upward. As the flies left the dead bird they ascended toward the apex where they were collected in shell vials. This technique yielded some flies. *Lynchia hirsuta* Ferris was the only species that O'Roke was able to find on the quail.

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[1] Predoctorate Research Fellow, National Institutes of Health.

[2] Division of Entomology and Parasitology, University of California.

[3] This work has been done under the direction of Dr. M. A. Stewart whose supervision and help is deeply appreciated. The writer is also grateful to Dr. Joseph Bequaert of the Museum of Comparative Zoology, Harvard University, Dr. C. M. Herman, Patuxent Research Refuge, and Mr. Merton Rosen, Disease Laboratory, California Division of Fish and Game, for their many helpful suggestions.

The writer is indebted to the California Division of Fish and Game, Bureau of Game Conservation, for the loan of equipment and the invaluable aid of its personnel, particularly Fred Ross who built the first large insectary. Appreciation is also extended to Messrs. Ian McMillan, Ernest Twisselman, Henry Childs, Lester Hink and David Selleck for ganting this writer permission to trap quail on their ranches.

O'Roke also tried to obtain flies by trapping quail in a sparrow trap. To prevent the escape of flies from trapped birds he placed a gauze cover over the trap. He failed to obtain any flies in this manner.

For his third experiment O'Roke placed a wire cage containing a quail near a feeding area of wild quail in hopes that the flies on the free birds would be attracted to the captive bird, but this was not successful either.

Herman obtained hippoboscid flies by trapping quail in regular quail traps. These flies were placed in small, screened cages containing quail which were transported from the field to the laboratory. Herman was able to obtain both species common to the quail; namely, *Stilbometopa impressa* (Bigot) and *Lynchia hirsuta* Ferris.

In order for the writer to carry out a research program relating to the transmission of the *Haemoproteus* of the California Valley Quail, *Lophortyx californica vallicola* (Ridgway), by the bite of the quail hippoboscids, *Stilbometopa impressa* and *Lynchia hirsuta,* a large number of these flies had to be secured. The one successful method described by O'Roke for taking hippoboscids was not practicable for these studies. It meant the sacrifice of too many birds, blood studies on dead birds would be almost impossible, and the number of birds one could work with would be greatly limited by conservation and hunting laws, as well as one's markmanship.

Herman's methods, both those reported in the literature and those reported verbally to the writer, were used with some additions and modifications.

Quail Trapping

A great many of the trapping techniques used in these studies are those worked out by the personnel of the California Division of Fish and Game, Bureau of Game Conservation. Without the Bureau's splendid cooperation and assistance this project would have been almost impossible to accomplish.

For the inexperienced it might be wise to mention that before attempting to collect any birds, one should inquire of his State and Federal Game Agencies about the necessary scientific collecting permits. These local game agencies as well as Game Wardens should be consulted as to which area or areas contain the greatest number of the species of birds being sought.

During the present studies field headquarters were established in known quail-populated areas. A survey was then made of the immediate vicinity to determine the population of the various coveys, the locations of the coveys and their feeding and watering

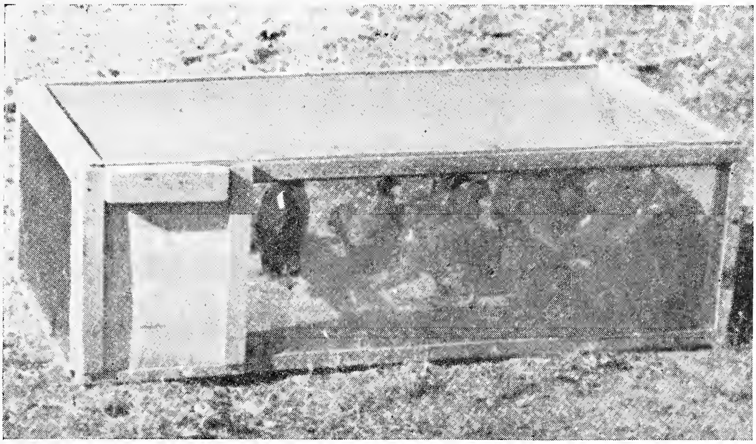

Fig. 1. Flyproof holding cage containing quail.

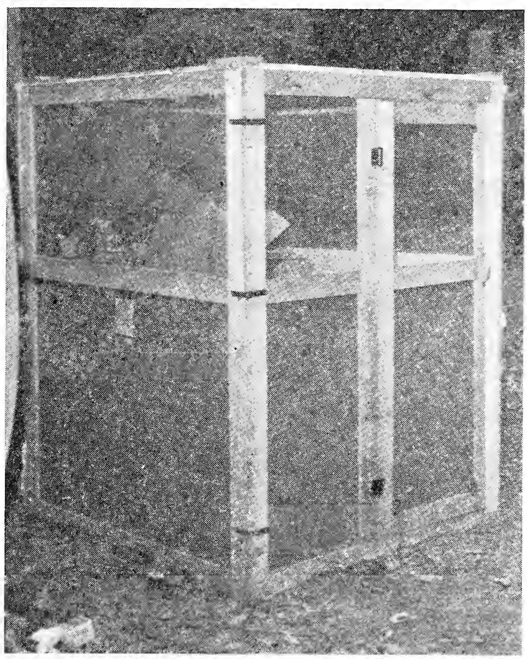

Fig. 2. Large insectary in use. Note how the sheets of masonite and the screening are fastened on the inside of the framework.

areas. Once these areas were located, the exact sites for the traps were determined and bait was scattered over these sites. Poultry scratch feed was found to be most satisfactory as a bait for quail. Such baits as wheat, barley, rice, onion and lettuce seeds were used with fair success.

When the quail became accustomed to eating the bait, traps were placed on the sites with the doors open. Bait was scattered over the same sites with the heaviest concentrations inside the traps. The traps were camouflaged with the flora peculiar to the area so that the birds would not be frightened away.

Quail traps of various sizes and construction were used.

After the opened traps were set up from two to three days, the doors were closed and the trapping begun. The baiting was continued as before. If this procedure is followed closely, one can obtain good catches.

Quail traps were checked twice a day, between 8:00 a.m. and 10:00 a.m. in the morning, and just after dusk in the evening. Quail expire quite readily if left exposed to the direct sun or extreme heat for even short periods of time; therefore, the morning collection hour should be adjusted according to prevailing temperatures in the area. The evening collection should never be omitted or delayed too long after dark as birds left in the traps are easy prey for predators.

Wooden cages similar to the cardboard containers used to transport young chicks are generally used for collecting birds from the traps and transporting them from one area to another. These cages have open air vents and work very satisfactorily when the loss of flies is of no consequence. Since burlap sacks are flyproof, it was suggested that the writer use these in place of the regular wooden cages for transporting birds. This practice proved most costly as far as birds were concerned since the quail sometimes huddled together in the almost airless sacks and completely smothered one another. After using the sacks a few times, the writer devised a flyproof holding cage that was much more successful (Fig. 1).

Each flyproof holding cage was designed to hold approximately twenty birds. The cage measured 18 inches in width, 24 inches in length and 8 inches in height. The framework consisted of 1 × 1 inch finished fir stock. The bottom of the cage was fitted with a piece of three-eighth inch plywood. The sides and top were covered with #16 mesh bronze screen cloth. The screen cloth was tacked down on the outside of the framework and covered

with one-half inch batting to prevent the screen cloth from unraveling. A sliding galvanized sheet metal door (#28 gauge) was placed at one end of the long side of the cage (Fig. 1).

To remove the quail from a trap the holding cage was placed adjacent to the release door of the trap and the birds were gently coaxed into the holding cage. Once the birds were removed to the holding cages they could easily be transported to the field laboratory (Fig. 2).

Portable Insectaries

To facilitate the removal of flies from the trapped birds, and to insure the recovery of the total number of flies on each bird, two flyproof field insectaries were devised and built. These insectaries have been a major factor in the success of the writer's entire research program.

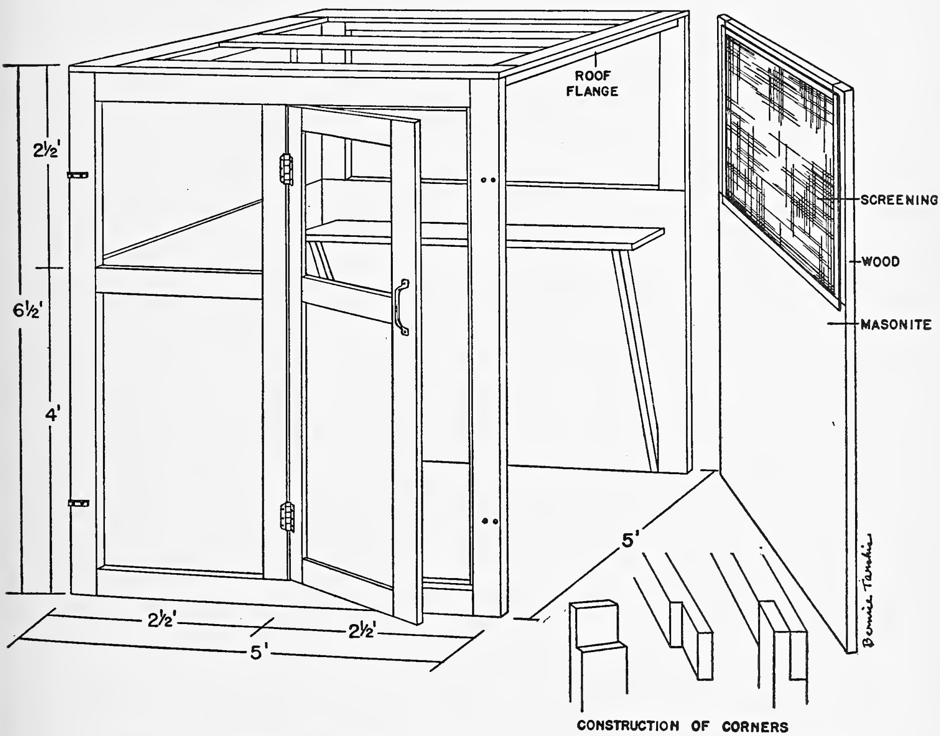

Fig. 3 Large insectary. One side is shown removed and the screen cloth has been omitted on all but the removed side to clarify the details of construction.

The large insectary was best used when large-scale trapping operations were in progress. The small insectary was most ideal for limited trapping operations and indoor work.

The large insectary (Figs. 2 and 3) was a collapsible house five feet square and six and one-half feet high. The house was built in five separate sections: a roof and four sides. One side was fitted with a door. The framework of each section was made of 1×4 inch unfinished fir stock. The bottom portion of each side of the house was fitted with a sheet of masonite 4×5 feet (the 4 foot measurement being vertical). Each sheet of masonite was fastened to the 1×4 framework on the inside so that the inner walls of the assembled house formed a smooth, unbroken surface. Since the masonite is generally brown in color and the flies are various shades of brown to black, the masonite walls on the inside of the house were painted white so that the flies could be easily seen when they flew onto the masonite. For the same reason the house was generally set up on a large white canvas.

The remaining two and one-half feet of each side were covered with #16 mesh bronze screen cloth. The screen cloth was tacked down on the inside of the framework. One inch fir batting was placed over the tacked edges of the screen cloth.

The roof of the house consisted of a framework of 1×4 inch unfinished fir stock. A piece of 1×4 inch fir stock was placed across the center of the framework for added support. The roof was covered with #16 mesh bronze screen cloth and one inch batting was placed over the tacked down edges. There was a flange all the way around the underside of the roof. This was attached one inch in from the outside edge. This flange kept the roof from slipping off the top of the house and helped steady the upright sides of the house. The house was held together at each corner by two, four inch right angle irons. A hinged shelf, supported by two removable supports, was attached along one inside wall of the house. A small door was placed in one wall so that birds could be released as they were examined.

The large insectary could be assembled and taken apart with the utmost ease and was light enough for one man to handle without difficulty. The convenience with which the unassembled insectary could be stored when not in use was another great advantage. The house was large enough to accommodate two men with ease and three men without difficulty when necessary. A two man team could easily defly, blood smear, band, and record all the necessary information on a great number of birds each day. The assembled house is shown in Fig. 2.

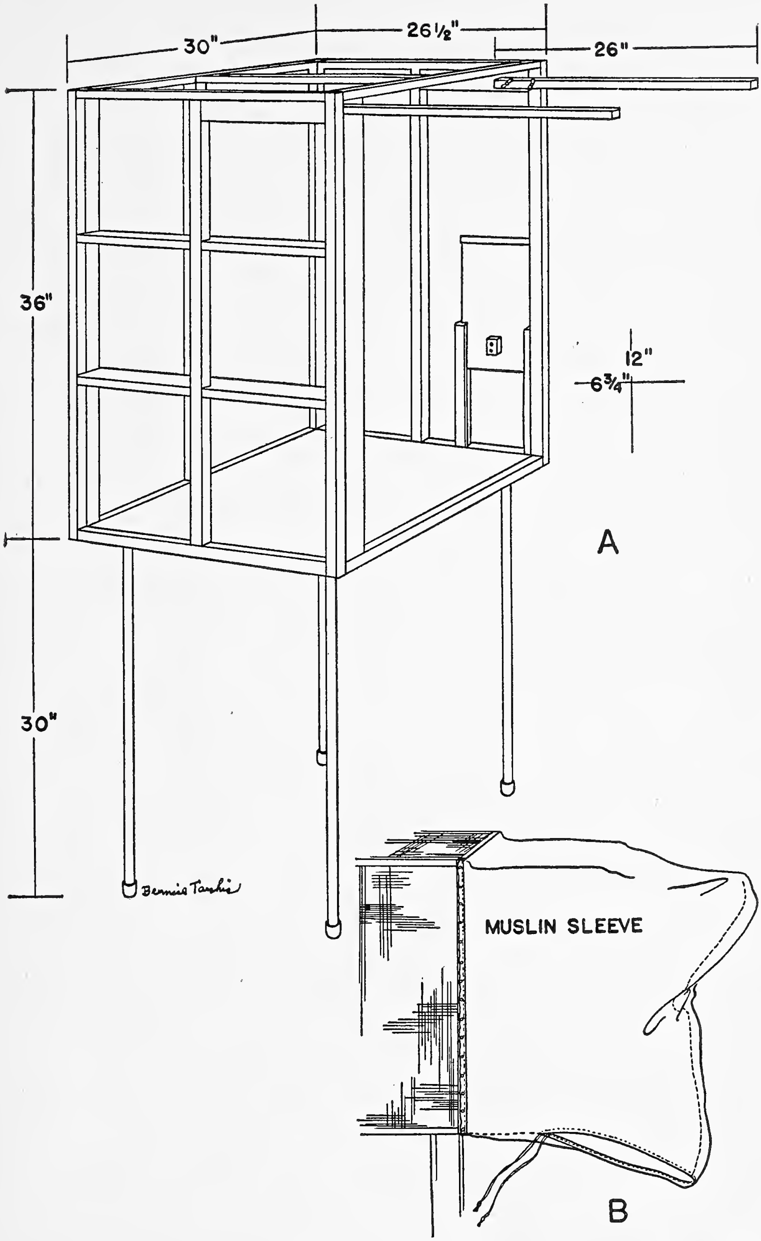

Fig. 4 Small insectary. A, shows insectary before addition of screen cloth and muslin sleeve. B, shows tailoring of muslin sleeve and its attachment to the front of the insectary. The top edge has been tacked and covered with batting, the side edge has been tacked only.

The small insectary was built for a dual purpose. It was used in the field when one man was working alone. It was also used as an insectary in the main laboratory where it was used for deflying quail, introducing flies onto quail, and for a host of other experimental purposes. It was especially valuable indoors since it took up so little space.

This insectary consisted of three screened sides, a screened top, a solid wooden bottom, and a large canvas "sleeve" attached to the fourth side (Figs. 4 and 5). The insectary was 30 inches long, $26\frac{1}{2}$ inches wide, and 36 inches high. The framework was 1×1 inch finished fir stock. The bottom of the insectary was fitted with a three-fourth inch piece of plywood. Number 16 mesh bronze screen cloth was attached on the outside of the insectary with carpet tacks and further secured with one-half inch fir batting. One side of the insectary was fitted with a galvanized sheet metal door (# 28 gauge) through which the deflied quail were released when the insectary was used in the field. Several shelves were also fitted on one inside wall to hold all the necessary equipment. See Figs. 4A and B for the construction of the insectary.

The small insectary was supported by four, three-fourth inch, galvanized metal pipe legs. The bottoms of these legs were fitted with ordinary pipe caps. The legs were screwed into four, three-fourth inch floor flanges permanently attached at the corners on the underside of the insectary. These legs were removable.

The sleeve was made of heavy 54 inch wide unbleached muslin. A piece of muslin 3 7/9 yards long was used for the sleeve. One selvage edge was tacked down to the framework (Fig. 4B), and the other selvage edge was seamed together. Twelve inches of the open bottom end were sewed together, the remaining portion was hemmed to form a tunnel through which a cord was run (Fig. 4B). The seated worker put the sleeve over his head and then drew the cord up snugly around his waist (Fig. 5).

Two 26 inch removable wooden bars were placed on the inside near the top of the insectary so that the muslin sleeve would be held up out of the operator's way (Fig. 4A and Fig. 5).

Examination of Birds For Flies

After the quail were removed from the traps and placed in the screened holding cages they were taken to the field insectary where they were examined for flies, banded, sexed and aged, and blood smeared. When the large house was used several of the holding cages were brought into the house and the examination work went on uninterrupted until all the birds were checked. When the small

insectary was used, about fifteen quail at a time were placed in a small holding cage which was placed in the insectary.

Hippoboscid flies have the ability to adhere rather tenaciously to the hosts' feathers. It was therefore necessary to ruffle the birds' feathers for a considerable period of time in order to force all the flies to leave the bird. The degree of tenacity was dependent upon the prevailing temperature. During the early morning hours and during the colder months the flies clung so tenaciously to the feathers that they had to actually be pulled off. When the flies are not feeding they are most generally located near the tail end of the bird's body. When the flies are feeding they are generally situated

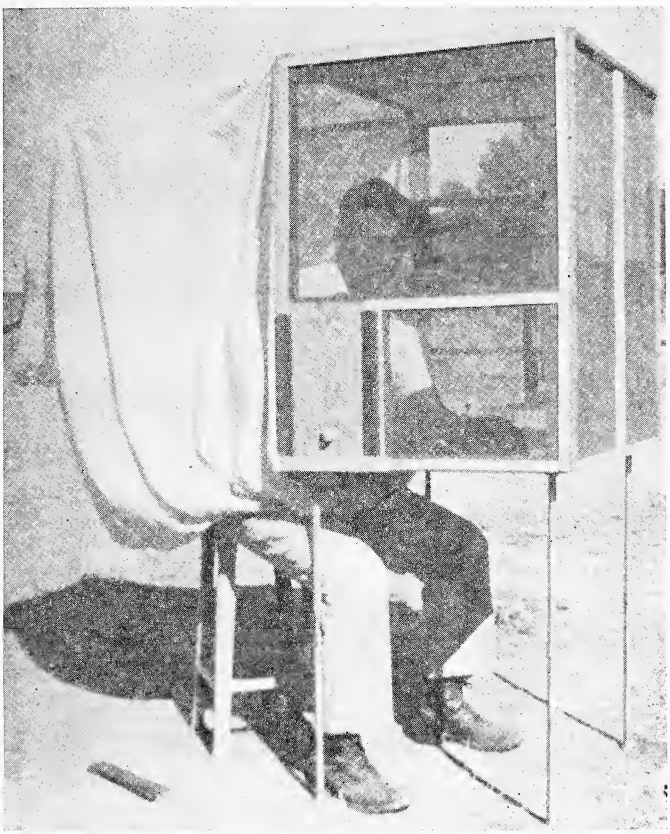

Fig. 5. Small insectary in use. Note manner in which extending arms at top of the insectary hold up the muslin sleeve and keep it out of the worker's way. Also note manner in which muslin sleeve is drawn up around the worker's waist.

under the feathers near the neck. It is therefore necessary to ruffle all the feathers on the bird's body in order to get all the flies present.

Stilbometopa impressa and *Lynchia hirsuta* are both positively phototropic. Flies flushed from the birds almost always headed for the side of the insectary having the greatest amount of light; thus, the flies were generally recovered from the screened portion of the insectary. Once the flies alighted they were easily urged into shell vials.

No matter which insectary was used by the writer, he was able to take all the flies present on the birds examined. To date close to 1600 adults of *Stilbometopa impressa* and more than 1000 adults of *Lynchia hirsuta* have been taken from trapped quail.

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NOTICE

A special sale of all overstock reprints of articles which have appeared in the new series of **Entomologica Americana** since 1926 is now in progress. A price list may be obtained from George S. Tulloch, 22 East Garfield Street, Merrick, N. Y.

Positive microfilm prints of the Synopsis of the Principal Larval Forms of Coleoptera by Boving & Craighead (Vol. 11 of Entomologica Americana) are now available for sale at three dollars each. Send orders to Mr. R. R. McElvare, 26 Bogart Avenue, Port Washington, N. Y.

ADDITIONS TO VESPINE BIOLOGY IX: TEMPERATURE REGULATION IN THE COLONY

By Albro T. Gaul, Brooklyn, N. Y.

The response of Vespine wasps to warm weather has been partly treated in the literature. It is the purpose of this paper to summarize this literature and to add the results of certain experiments in order to present the typical responses of these social wasps to hot weather. This paper will be largely restricted, however, to a consideration of the attempts on the part of the wasps to regulate the temperatures within the nest.

This author has already shown that flight is dependent upon a minimal temperature threshold (3). Sotavalta has shown that Vespine wing beat frequencies are more or less constant and independent of temperature variations (6), while the present author has indicated that well known thermodynamic principles may account for a species having a wing frequency which is independent of temperature, while another species may vary its wing frequency directly with temperature (4). I have further shown that there are distinct temperature cycles within the Vespine nest, correlated with the general metabolic activity of the total nest population (5).

When the temperature in the nest reaches an apparently, uncomfortably warm level, the wasps respond by fanning their wings. This fanning creates air currents in the enclosed nest space, increasing evaporation and thus cooling the brood. It is the author's previous opinion (2) that this nest ventilation is the result of the individual wasp to temperature or humidity conditions. Wasps living with enclosed nests or on open combs will demonstrate this response under stimulation with heat. Steiner (7) has noted this same response among *Polistes,* which builds only gymnodomous nests.

It is thought that fanning of the wings is an individual response because of the following experiments: an exposed brood comb of *Dolichovespula arenaria* Fab. with 20 workers, was placed in a specially built water bath compartment. As the temperature of the comb was increased, one after another of the wasps began fanning their wings. No two wasps began fanning at the same time, or at the same temperature. In another approach to the problem, single wasps were placed in individual vials with a thermometer. The temperature of the vials was increased. The heat stimulated the fanning of the wings; but among 15 wasps thus treated, only two began fanning at the same temperature. It is thus clear that the

wasps must have either a random assortment of fanning thresholds, or thresholds which can be modified according to previous conditioning. No attempt was made to retain the segregated wasps in their vials for any long period of time in order that they might have identical recent conditioning experiences.

It may be considered an actual advantage to the colony if each wasp has a different effective threshold for ventilating. Without a graded series of such thresholds, either no ventilation would be done, or every wasp would participate. Since discomfort from heat is a matter of degree, the attempts to cool the nest need only respond in proportion to the heat. Thus slightly uncomfortable temperatures require only moderate ventilation, and this function is best served when each wasp has an apparently different threshold.

Fanning with the wings may also be a response to low temperatures. This idea was first proposed by Dotterweich (1) who claimed that pre-flight wing fluttering by Sphingid moths was an attempt to raise the wing muscle temperature through excercise. This same phonomenon has been observed on cool mornings among *Vespula maculifrons* Buy. and *Vespula rufa* var. *consbrina* Sauss.

Fanning and ventilating are also the result of chemical stimulation. Smoke, fumes of ether, acetone, gasoline and a number of other aliphatic and aromatic hydrocarbons will stimulate the fanning response.

It has already been pointed out that there is a more or less constant wing beat frequency for each species and caste of wasp that has been tested (4, 6). It also seems that there is a constant wing beat for the fanning-ventilation activity. While this frequency is constant, it is considerably lower than the flight frequency. In *Dolichovespula maculata* L. for example, the flight frequency is 95 strokes per second, while the ventilation frequency is 35 strokes per second (by electronic determination).

When the temperature within the nest becomes excessively high, the ergates frequently attempt to control the heat by carrying water to the nest. This phenomenon has been noted by the author among many North American Vespinae (2) and has been remarked among Palearctic Vespinae by Weyrauch (8). Steiner (op. cit.) has observed this same habit among *Polistes*. Weyrauch has further recorded observations on the apparent use of trophallactic secretions to cool the nest through evaporation.

On only one occasion, the author observed a colony which had abandoned their attempt to cool the nest. The nest was in a screen cage in the direct sunlight on a hot dry day (Brooklyn, N. Y. Au-

gust 29, 1946). After carrying water throughout the morning, the wasps gave up this work at noon and resorted to aimless flying. Few wasps flew more than six feet from the nest. All foraging and nest expansion activities had come to a halt. No wasps were seen entering or leaving the nest during this temporary abandonment. In order to determine if this cloud of wasps comprised the entire ergate population of the colony, the nest was gently prodded with a long stick. Despite a more vigorous prodding, no vengeful defenders flew from the nest, so it was tentatively concluded that the entire worker population had deserted. About 2:30 P. M., as the nest became shaded and its internal temperature fell, the wasps resumed their normal activities. No harm seemed to come to the brood, since colony expansion continued normally.

This points to the probability that the fanning-ventilating activity is a response for the comfort of the adults in the nest rather than for the service it may render the brood. Since the brood have a much higher percentage composition of water, and since they are white, they would tend to resist heating more than the adults whose lower water content and darker bodies would tend to absorb heat. This probability is borne out by Weyrauch's observation on the use of the larval trophallactic fluids to cool the nest; because this fluid was expended with no apparent harm to the brood.

It is probable that Vespine larvae are acutely sensitive to direct radiation. Nests without their envelopes have been placed in direct sunlight. The exposed larvae have subsequently failed to mature or have emerged as teratological forms. The pupae, within their cocoons, have matured normally. Nests without their envelopes which were kept in the shade have never exhibited such pathological symptoms, although the temperatures were often the same under both conditions. It is therefore my belief that the larvae may be killed by sunburn.

In conclusion, wasps beat their wings to ventilate their nests when it gets hot inside. The ventilation frequency is much lower than the flight frequency. Ventilation is an individual response. Wasps may carry water or use trophallactic secretions to cool their nests. If water carrying becomes ineffective the nest may be temporarily abandoned. It is likely that all these measures are directed to the comfort of the adults inside the nest. The larvae can withstand fairly high temperatures, but are highly sensitive to direct radiation.

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BOOK NOTES

Forest Entomology, by Samuel A. Graham. xii + 351 pp., 85 figs., 12 tables. 6 × 9 ins., cloth bound. Third edition. 1952. McGraw-Hill Book Company, New York, N. Y. (Price, $6.00).

The third edition of this standard textbook provides students and workers in forest entomology with the fundamentals of the subject along with all of the developments which have occurred since the second edition appeared in 1939.

The early chapters deal with a historical review of the science, methods of surveying damage caused by insects and such ecological considerations as reproductive potential, enviromental resistance and population levels. Seven chapters are devoted to the varied aspects of control and five chapters systematically consider the various insects which attack specific tissues (leaves, sap, meristem, phloem, wood) of the plant. There is a bibliography of twenty three and an index of sixteen pages.

The subject matter is presented in a concise manner and with outstanding clarity. The text is supplemented with figures, graphs and tables. The printing and binding are of excellent quality.—George S. Tulloch, Merrick, New York.

Another Synonym, Lepidoptera, Geometridae: In the Pan-Pacific Entomologist, 1941, Vol. 17, p. 192, the Rev. Edward Guedet described the species *Lygris pulcherrima* from a single male taken at Cave Creek, in the Chiricahua Mts. of Arizona, July 4, 1930.

In 1949 (Bull. Southern California Acad. Sci., XLVIII, 10), the author described as new the species *Azelina waltonaria* from a small series taken in the same Arizona mountain range and later (1951, Bull. Southern California Acad. Sci., L, 54), transferred the species to the genus *Snowia* Neumogen, on the strength of the similarity of the female genitalia. My friends, Charles Hill of Glendale, Calif. and Dr. Edward S. Ross of the California Academy of Sciences in San Francisco, remarked on the similarity of the above species and on a later trip to San Francisco Mr. Hill brought back an excellent drawing of *pulcherrima* Guedet as well as a sketch of the wing venation, showing the species to be an Ennominid and the same as *Snowia waltonaria* Sperry. *Pulcherrima* Guedet should then be transferred from the Larentid genus *Lygris* to the Ennominid genus *Snowia* and the synonymy should stand as follows:

Snowia pulcherrima Guedet
Lygris pulcherrima Guedet
syn. *Azelina waltonaria,* Sperry
syn. *Snowia waltonaria,* Sperry

The author is much indebted to his friends Charles Hill and Dr. Edward S. Ross for the above correction.—John L. Sperry, Riverside, California.

Spiders Feeding on Insects: Recently Dr. Willis J. Gertsch identified a few spiders for me, collected as they were feeding upon insect prey. A female *Philodromus virescens* Thorell was taken while feeding on an alfalfa caterpillar, *Eurymus eurytheme* (Bdv.), in an alfalfa field at Erda, Utah, September 12, 1951. A female *Misumenops celer* Hentz was found while feeding on a one-fourth grown prominent larva, *Datana* sp., on a squawberry bush at Pahvant, Millard County, Utah, in an inactive sand dune area. Dr. G. E. Bohart was with me at the time this was observed, July 24, 1951. Dr. C. H. Curran named a syrphid fly prey for me as *Metasyrphus meadi* Jones. This was present on a home garden Compositae flower, being not quite dead from the attack of the

female spider, *Misumena vatia* Clerck. A larger female spider, *Habronattus brunneus* Peckham, was found while it fed on a beetle on a petunia flower in a home garden at St. George, Utah, June 15, 1951.

Spiders were rather numerous on flowers of a wild compositae, *Senecio* sp., upon which Dr. Bohart and I were collecting wild bees and other insects on May 17, 1951, a few miles north-west of Wellsville, Utah. A few of the many spiders taken in my insect net were saved. Dr. Gertsch identified these as: *Phidippus johnsoni* Peckham, a male *Aculepeira verae* Chamberlin & Ivie, *Habronattus brunneus* Peckham, *Icius similis* Banks, *Xysticus cunctator* Thorell, and *Chiricanthium inclusum* Hentz.

During the summer of 1943 predacious *Tarsotomus* sp. mites were present on recently dead honey bees, picked up in front of the hives of M. F. McCune at Delta, Utah. These mites were identified by Dr. H. E. Ewing.—George F. Knowlton, Logan, Utah.

Leafhoppers in Abundance: In Utah we frequently find the leafhopper, *Erythroneura ziczac* Walsh, and smaller numbers of related species of this same genus, so very numerous and active on Virginia creeper foliage that persons going thru doors on vine-shaded porches often become seriously annoyed due to the actively hopping leafhoppers lighting on their faces and even entering the nose or mouth. *Tamarix gallica* in parts of Utah has been similarly leafhopper infested by a larger green species. During the later part of September and much of October of 1950, an unusually heavy population of adult leafhoppers were present on each *Spirea* bush in one back yard at Logan. Specimens sent to David A. Young all proved to be *Typhlocyba rosae* (L.). Also, during late August and early September of 1950, squash and gourd vine foliage on one home lot at Dalta, Utah, had foliage badly spotted by the feeding of very great numbers of a leafhopper; these Mr. Young identified as *Empoasca abrupta* De. L. In all of the cases here reported, the extremely numerous leafhoppers became conspicuously active and attracted visual and auditory attention whenever a passer-by approached their host plant. Leafhopper feeding damage also was commonly present wherever the above unusually high leafhopper populations were observed.—George F. Knowlton, Logan, Utah.

EXCHANGES AND FOR SALE.

This page is limited to exchange notices and to small For Sale advertisements from members of the Society and from actual paid subscribers to the Bulletin exclusively. *Exchange notices* from members of the Society and from subscribers are limited to *three (3) lines each,* including address; beyond 3 lines, there will be a charge of $1.00 for each 3 lines or less additional. *For Sale* ads will be charged at $1.25 for each 3 lines or part of 3 lines. *Commercial or business* advertisements will not be carried in this page, but will go in our regular advertising pages at our regular advertising rates to *everybody.*

LEPIDOPTERA AND ORTHOPTERA from Florida in papers and local specimens mounted to exchange for other Lepidoptera. —Alex K. Wyatt, 5842 N. Kirby Avenue, Chicago (30), Ill.

WANTED—Geometrid moths, for cash or exchange. John L. Sperry, 3260 Redwood Drive, Riverside, Calif.

CERAMBYCIDAE AND CHRYSOMELIDAE from Asia and Pacific desired for determination; purchase; exchange.—J. Linsley Gressitt, Pacific Science Board, Bishop Museum, Honolulu, T.H.

WANTED—Proc. Ent. Soc. Phila., vols. 1–6; Proc. Calif. Acad. (Nat.) Sci., vols. 1–7; Psyche, vols. 11, 13, 15; Trans. Amer. Ent. Soc., vols. 1–5; Bull. Buff. Soc. Nat. Sci., vols. 2–3; Proc. Acad. Nat. Sci. Phila., vols. 1–8. C. F. dos Passos, Mendham, New Jersey.

FOR SALE—Copies of the majority of the back issues of both Entomologica Americana and the Bulletin are available and for sale as individual items. Want lists will receive prompt attention. —EDITOR.

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Insects

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CONTENTS

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Vol. XLVII OCTOBER, 1952 No. 4

THE GENUS ANTILLOCORIS KIRK. IN THE UNITED STATES (HEMIPTERA—LYGAEIDAE)

By Harry G. Barber, Washington, D. C.

The genus *Antillocoris* is represented in the United States by three species: *Salacia pilosulus* Stal, *Cligenes minutus* Bergroth and *Antillocoris discretus,* new species. A fourth species, *Pygaeus pallidus,* described by Uhler from Grenada, West Indies, has a wide distribution in the West Indies, Central America and South America, and possibly Florida should be added. All published records of the occurrence of this species in the eastern United States should be disregarded. Uhler, 1894, was at fault in confusing the species, recording his *pallidus* from "Cuba, Texas, Florida, the eastern side of the United States as far as Tewksbury, Massachusetts, and spread into lower Canada." From the evidence in the Uhler collection at the U. S. National Museum that author identified specimens from Massachusetts, as well as other eastern localities, as *pallidus,* which were one year later described by Bergroth as *minutus.*

A. pilosulus (Stal) is quite distinctive because of its rather long, dense pilosity, variegated corium and longer antennae. It is southern in its distribution. From the evidence at hand the range of this species is from southern New Jersey through the southeastern states to Florida, Tennessee, Missouri, Alabama, Louisiana, Arkansas and Texas.

A. minutus (Bergroth) is a dull, dark castaneous, rather coarsely punctate species with sparse, recumbent silvery hairs. Two sorts of brachyptery occur: (a) with abbreviated membrane, (b) membrane absent and the posterior margin of the corium truncate. This species is northern in its distribution, ranging from Canada, through the New England states, New York. New Jersey, Ohio, Indiana, Illinois, Iowa, Nebraska and Missouri.

Antillocorus discretus n. sp.

Dull, testaceous or tawny, very sparsely and finely pilose. Head about one-fourth wider than long; preocular part as long as an eye. Antennae as long as width of pronotum; basal, second and fourth segments equal, third segment nearly one-third shorter than second; basal three segments somewhat clavate, fourth segment fusiform. Pronotum slightly longer and twice as wide as head, lateral margin lightly impressed, transverse impression very shallow. The anterior lobe slightly shorter than the posterior, a smooth transverse, slightly elevated callus occupies the anterior lobe, posterior lobe finely, sparsely punctate. Scutellum equilateral, slightly longer than pronotum, finely punctuate on the sunken disk and along the sides, carinate apically. Clavus narrow, with three irregular rows of punctures. Commissure a little less than half as long as scutellum. Corium with costal margin nearly equal to combined length of head, pronotum and scutellum; two rows of punctures parallel the claval suture; closely, finely punctate between the median vein and the costal margin; central disk with an elongate smooth area. Membrane extended to apex of abdomen, infumed, opaque. Legs testaceous. Length 2.00 mm.

Type: Male, La Belle, Fla., July 16, 1939, collected by P. W. Oman, United States National Museum, Cat. No. 16,268. Paratypes, males and females: 2 with same data as type; 1 E. Fla., collected by Ashmead and labeled *Rhyparochromus minutus* Uhler; 1 Suwanee Springs, Fla., July 3, 1948, 2 Branford, Fla., Aug. 4, 1939, 2 Hillard, Fla., Aug. 6, 1939, all collected by R. H. Beamer; 1 Caldwell Co., Texas, July 13, 1945, collected by J. W. Monk; 2 Okefenokee Swamp, Ga., Aug. 3, 1934, collected by P. A. McKinstry; 15 Hillsborough Co., Fla., Aug. 14 and 18, taken at light by Hubbell and Friauf; 1 Rock Bluff, Fla., Apr. 4, 1927, collected by C. A. Crosby; 3 Lakehurst, N. J., March 21, Apr. 4, and May 2, 1908, collected by the author in sifting; all in the United States National Museum.

The following are in the collection of the University of Kansas: 24 Hillard, Fla., Aug. 6 and 19, 1939; 39 Branford, Fla., Aug. 4, 1939; 3 Royal Palm Park, Fla., July 21, 1948; 6 Suwanee Springs, Fla., July 3, 1948; 3 Deerfield, Fla., July 26, 1948; 5 La Belle, Fla., July 16, 1939; 1 Sanford, Fla., July 31, 1933; 4 Old Town, Fla., July 11, 1939; 2 Lacoochee, Fla., July 7, 1948; 2 Lake City, Fla., Aug. 5, 1939; 1 Sebastian, Fla., July 7, 1948; 1 Cedar Keys, Fla., July 12, 1939; 1 Parish, Fla., July 9, 1948; 1 Plant City, Fla., July 14, 1939; 1 Lake Placid, Fla., July 13, 1948; 38 Okefenokee Swamp, Ga., July 30 and Aug. 4, 1934.

A. discretus is most closely related to *minutus*. Besides being differently colored, it is more finely and sparsely punctate, the pronotum is relatively wider, the scutellum equilateral and the antennae equal to width of pronotum. So far as known it occurs only in the macropterous state, while *minutus* has two brachypterous phases.

Key to Species of Antillocoris in the United States.

1. Dorsum evidently pilose, longest hairs on scutellum and disk of corium equal in length or longer than the longest hairs on first antennal segment 2
   Dorsum appearing almost glabrous or with longer hairs on scutellum and disk of corium shorter than most of hairs on first antennal segment 3
2. Dorsum with the pile more profuse and erect, that on scutellum longer than the hairs on first antennal segment.
   pilosulus Stal
   Dorsum with the pile sparser and recumbent, that on scutellum shorter than longest hairs on first antennal segment.
   minutus Bergroth
3. Dorsum shining. Anterior acetabulum set off from pleurite by several punctures. Lateral margin of anterior lobe of pronotum scarcely marginate, viewed laterally.
   pallidus Uhler
   Dorsum dull on pronotum and scutellum. Anterior acetabulum not set off from the pleurite by a row of punctures. Lateral margin of pronotum distinctly marginate, viewed laterally.
   discretus n. sp.

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UNDESCRIBED SPECIES OF NEMATOCEROUS DIPTERA. PART I.

By Charles P. Alexander, Amherst, Mass.

In recent years a large number of species of Nematocerous Diptera, representing several families, have come to hand, mostly included in shipments of Tipulidae from many parts of the World. In this paper, and others proposed under the same general title, certain of the more interesting of these flies will be described. Acknowledgements will be found under the accounts of the individual species. Except where indicated to the contrary, the types of the various novelties will be preserved in my personal collection of Diptera.

Trichoceridae

Trichocera fattigiana n. sp.

General coloration gray or brownish gray, the praescutum with four pale brown stripes; legs dark brown; wings with a weak brownish tinge, the base more yellowed, the stigma slightly darker; R_{2+3+4} in almost direct alignment with *Rs*, a little longer than R_{2+3}; cell *2nd A* broad; male hypopygium with a small pale tubercle on dististyle; phallosome consisting of a central plate, the outer lateral angles produced laterad into slender spines; a narrow median structure in center of phallosome.

Male: Length about 5.5–6 mm.; wing 6–6.7 mm.; antenna about 3.2–3.4 mm.

Rostrum dark brown; palpi black. Antennae with the scape and pedicel testaceous brown, flagellum black. Head yellowish gray.

Pronotum brownish gray. Mesonotum brownish gray, the praescutum with four pale brown stripes that are relatively inconspicuous against the ground; scutal lobes somewhat similarly darkened; median region of scutum light gray; scutellum more ochreous yellow, especially at apex; postnotum, including pleurotergite, gray pruinose. Pleura brownish gray. Halteres whitened, the knobs dark brown. Legs with the coxae gray pruinose; trochanters obscure yellow; femora uniformly dark brown, tibiae and tarsi somewhat darker brown. Wings with a weak brownish tinge, the base more yellowed; stigma oval, slightly darker than the ground, lying entirely distad of R_2; no other dark pattern on wings; veins dark brown, more yellowed in the prearcular field. Macrotrichia of veins relatively short and inconspicuous. Venation: R_{2+3+4} almost in

direct longitudinal alignment with *Rs,* a little longer than R_{2+3}; basal section of M_{1+2} a little more than one-half the second section; cell *2nd A* broad, the vein very strongly arcuated to almost subangulate at near midlength.

Abdomen, including hypopygium, uniformly dark brown. Male hypopygium with the ventromesal lobes of basistyles barely contiguous at the midline, not forming a complete so-called coxal bridge. Dististyle subcylindrical, at base of its mesal face with a very small and weak pale tubercle; mesal face of style basad almost to the tubercle with abundant short pale setae. Phallosome consisting of a central plate, the outer lateral angles of which are produced laterad and very slightly caudad as slender spines; in the center of the phallosome there juts caudad a narrow median structure.

Habitat: Georgia, Tennessee, Illinois.

Holotype: ♂, Atlanta, Georgia, December 9, 1945 (P. W. Fattig). *Paratypes:* 1 ♂, Knoxville, Tennessee, December 4, 1938 (A. C. Cole); 1 ♂, University Woods, Urbana, Illinois (V. E. Shelford); Collector's No. H 3985.

I am very pleased to name this fly for Professor P. W. Fattig, who has added vastly to our knowledge of the insects of Georgia. By my key to the Eastern North American species of *Trichocera* (Diptera of Connecticut, 1: 189; 1942), the fly runs to what has been determined as being *Trichocera saltator* (Moses Harris, 1782), a very distinct fly having the phallosome quite different, appearing as elongate blades and not as lateral horns from a flattened central plate. The exact identities of certain of the flies that center about *saltator* remain much in doubt. The structure of the phallosome, as above described, while being quite different from that of other eastern species is found in certain Palaearctic and western Nearctic forms.

Trichocera brevicornis n. sp.

General coloration dark brownish gray, the praescutum with four ill-defined clearer brown stripes; antennae unusually short, only a little more than one-third as long as the wing, the first flagellar segment subequal in length to the ninth; wings with a strong dusky tinge, unpatterned except for the vaguely darker stigma; abdomen, including the hypopygium, uniformly darkened; male hypopygium with the coxal bridge stout, the lobes contiguous at the midline; dististyle simple; gonapophyses appearing as very long pale blades from a short narrow base.

Male: Length about 5.5–5.7 mm.; wing 5.5–6 mm.; antenna about 2–2.1 mm.

Female: Length about 6–6.2 mm.; wing 6.8–7 mm.

Rostrum and palpi brownish black. Antennae unusually short, black throughout; first flagellar segment about equal in length to the ninth, distinctly longer than the eighth; basal six flagellar segments relatively stout, the others becoming setaceous. Head brownish gray.

Pronotum brownish gray. Mesonotum dark brownish gray or plumbeous gray, the praescutum with four ill-defined clearer brown stripes. Pleura plumbeous gray. Halteres weakly infuscated, the knobs still darker brown, the base of stem restrictedly paler. Legs with the coxae plumbeous; trochanters testaceous brown; remainder of legs dark brown, the femoral bases vaguely more brightened. Wings with a strong dusky tinge, the stigmal region vaguely darker; prearcular field slightly more whitened; veins brown. Venation: R_{2+3+4} variable in length, in cases longer than R_{2+3}, in other specimens shorter; cell M_1 longer than its petiole; cell *2nd A* relatively narrow.

Abdomen dark brown, sparsely pruinose; hypopygium dark brown. Male hypopygium with the darkened portions of the ventromesal lobes of the basistyle (coxal bridge) broad, contiguous at the cephalic angle. Dististyle a relatively short simple structure, nearly cylindrical, without lobes; outer surface with long scattered pale setae, the longest only a little shorter than the diameter of the style; vestiture of mesal face of style short and pale, very abundant. Gonapophyses appearing as very long pale blades from a short narrow base.

Habitat: Georgia.

Holotype: ♂, Atlanta, November 25, 1945 (P. W. Fattig). *Allotype:* ♀, Dallas, December 9, 1945 (P. W. Fattig). *Paratopotypes:* 5 ♂♀, November 17, 1945–January 7, 1946; *paratypes*, 7♂♂, with the allotype, December 9, 1945.

The nearest described relative of this fly is the species commonly determined as being *Trichocera saltator* (Moses Harris, 1782), which differs in the coloration of the body and wings, and especially in the longer antennae and in the details of structure of the male hypopygium. By Edwards's last key to the British species of the genus (Trans. Soc. British Ent., 5: 153; 1938), the fly runs to *saltator*. It should be noted that the venational character of relative proportions of veins R_{2+3+4} and R_{2+3}, stressed by Edwards as a major key character, breaks down in various species, including the one under consideration. By Osten Sacken's key (Mon. Diptera N. Amer., 4: 236–237; 1869), the fly runs to *T. brumalis* Fitch, which is held as being a possible synonym of *T. saltator*.

Blepharoceridae

Philorus sequoiarum n. sp.

General coloration black, heavily pruinose; face black; antennae with scape brown, flagellum black; praescutum with a pair of brown intermediate stripes; legs black, the femoral bases narrowly paler; wings with the basal section of vein R_5 present; veins R_4 and R_5 strongly divergent on their outer third; vein *Cu* arched at near midlength, the cell widest at this point.

Female: Length about 5.8–6 mm.; wing 7.5–8 mm.

Mouthparts and palpi dark brown; face black, sparsely pruinose. Antennae with the scape brown, the flagellum black; segments gradually decreasing in diameter from the more basal ones outwardly, the terminal one reduced. Vertex reduced to a narrow strip, black, sparsely pruinose, narrowest before the ocelli; eyes large, bisected, the upper part more extensive, with larger ommatidia, setae of eyes short.

Thorax clear gray, the praescutum with a pair of brown intermediate stripes that are very narrowly separated medially; lateral stripes barely indicated as gray areas that are a little darker than the ground. Pleura clear light gray. Halteres with the stem yellow, the knob dark brown. Legs with the coxae and trochanters pale, sparsely pruinose; legs black, the femora narrowly brown basally; tibial spur formula 0–1–2; claws long and slender, glabrous on outer half. Wings hyaline, restrictedly more yellowed at base; outer half of costal cell more infuscated; veins brownish black, very distinct; a small blackened thickening in the axillary angle. Venation: Basal section of vein R_5 short but indicated, approximately one-third *r–m;* veins R_4 and R_5 strongly divergent on outer third, cell R_2 about one-half as extensive as cell R_4*;* vein *Cu* arched at near midlength, the cell widest at this point.

Abdomen blackened, light gray pruinose, the lateral borders of the segments narrowly pale. Valves of ovipositor small, yellow.

Habitat: California.

Holotype: ♀, Sequoia National Park, along small stream at Dorst Camp Ground, altitude 6500 feet, July 3, 1950 (C. P. Alexander). *Paratopotype:* ♀, pinned with type.

The most similar described regional species is *Philorus cheaini* Garrett, of the Canadian Rockies, which is still known only from the short and insufficient description. From this latter, the present fly differs in coloration and apparently in the venational details.

Blepharocera apoensis n. sp.

Mesonotum brownish black, gray pruinose, abdomen bicolored; eyes (female) relatively small, very unequally divided, the upper part very reduced; last tarsal segment with a conspicuous hairy protuberance at base, claws long and slender, each with two long spines and long black setae; wings with radial branches extending generally parallel to one another for almost their whole lengths.

Male: Length about 7 mm.; wing 8.5 mm.

Female: Length about 6.5 mm.; wing 8 mm.

Mouthparts produced, longer than the remainder of head, yellowish brown; maxillary palpi dark brown. Antennae black throughout; flagellar segments oval, gradually reduced in size, the last about one-half the penultimate. Eyes relatively small, the vertex correspondingly broad, only a little less than the exposed visible part of the eye when viewed from above; anterior vertex and front subequal in width. Eyes very unequally divided, the major lower part with large ommatidia and a short but dense white pubescence; the upper part reduced to a narrow section opposite the median ocellus, this area only about as wide as the diameter of a flagellar segment, with small ommatidia. Darkened facial areas linear, glabrous, on either side of base of clypeus. Head above black, sparsely pruinose.

Mesonotum brownish black, gray pruinose, the base of scutellum a little brightened. Pleura and pleurotergite dark brown, more yellowed beneath the wing root. Halteres with stem obscure yellow, knob brownish black. Legs with the coxae and trochanters brownish yellow, the tips of both on lower faces with dense brushes of black setae; remainder of legs brown, the outer tarsal segments brownish black; a conspicuous hairy protuberance at base of last tarsal segment; claws long and slender, simple, each with two long spines and several long black setae. Wings subhyaline, veins brownish black. Venation: Branches of *Rs* long, extending generally parallel to one another for almost their whole length, cell R_2 at margin being about two and one-half to three times as extensive as cell R_4.

Abdominal tergites bicolored, the bases of the more proximal segments yellow, pruinose, the broader apices black; outer segments more uniformly darkened; sternites more uniformly yellow.

Habitat: Philippines (Mindanao).

Holotype: ♂, with a question, Mainit River, Mount Apo, September 14, 1930 (C. F. Clagg); Museum of Comparative Zoology. *Allotopotype:* ♀, September 10, 1930; Alexander Collection.

The most similar regional species is *Blepharocera tetrophthalma*

Edwards, from low altitudes on Mount Kinabalu, North Borneo. This is entirely distinct in color and especially in the structure of the eyes. The type specimen of the present fly is believed to be a male but without dissection this cannot be fully determined. This is the first species of Blepharoceridae to be found in the Philippines.

Curupira chilena n. sp.

General coloration of body blue-gray, the praescutum with four brown stripes; antennae black throughout, pedicel elongate; eyes conspicuously bisected; fore and middle legs black, the femoral bases yellowed, posterior femora brownish yellow, the tips narrowly blackened; tibial spur formula 0–2–2; basitarsi simple and unmodified in both sexes; claws not swollen basally; veins of cephalic part of wing black, the remainder abruptly yellow; abdominal tergites tricolored; male hypopygium with the outer dististyle very complex in structure.

Male: Length about 6.5–7 mm.; wing 6.5–7 mm.

Female: Length about 6.5 mm.; wing 6.8 mm.

Mouthparts, including the palpi, black; maxillary palpi 4-segmented, excluding the palpiger, extending beyond the other mouthparts. Antennae black throughout, 15-segmented; pedicel elongate; flagellar segments short-cylindrical, crowded, especially so in the males, the antennae feebly clavate, the outer segments being slightly broader than the more proximal ones. Eyes of male conspicuously bisected, the larger upper half with larger ommatidia, the setae very short; head broadly holoptic above, forcing the ocellar triangle posteriorly. In the female, eyes much smaller and unequally bisected, the upper part much smaller; head dichoptic, the posterior vertex nearly as wide as the exposed part of the eye when viewed from above. Clypeus light gray; vertex gray, patterned with darker.

Thorax blue-gray, the praescutum with four brown stripes, the long intermediate pair narrowly separated by a ground line, in cases the darkened pattern much less distinct; postnotum more or less broadly yellowed behind. Pleura blue-gray, more infuscated surrounding the wing root. Halteres black, the base of stem more infuscated. Legs with the coxae gray pruinose; trochanters brownish yellow, the fore pair elongate; fore and middle legs black, the fore femora narrowly obscure yellow basally; posterior femora elongate, obscure brownish yellow, the tips narrowly brownish black; remainder of legs black; tibial spur formula 0–2–2; basitarsi of both sexes simple and unmodified; claws long and nearly straight, not swollen basally, hairy except on about the outer fourth; legs

densely covered with linear scale-like setae. Wings hyaline, the prearcular region more yellowed, the color due to the approximation of veins; anterior veins, including *C, R, r-m,* stem of *M* and base of *A* black, the remaining veins abruptly yellow. Venation: *Rs* very short; cell R_3 conspicuous, more than five times as extensive at margin as cell R_2; vein *A* atrophied beyond base.

Abdominal tergites handsomely tricolored, the sides broadly light bluish gray, the median area of the individual segments beyond the first with a blackened triangle, its point directed cephalad; in cases with the median line of the latter paler, obscure orange; posterior borders of tergites two to four inclusive, narrowly orange; sternites uniformly gray; hypopygium black. Male hypopygium with the caudal margin very deeply and acutely notched. Outer dististyle very complex, appearing as an expanded outer pale blade, subtended by a stouter setiferous arm that terminates in a decurved head; mesal edge near base produced into a stout lobe that is tipped with several setae, the more cephalic ones unusually long. Inner style a broadly flattened obtuse blade. Gonapophyses very long and slender, slightly exceeding in length the three more slender penis filaments.

Habitat: Chile (Santiago).

Holotype: ♂, Macul, altitude 1500 meters, March 11, 1949 (L. E. Pena). *Allotopotype:* ♀, pinned with type. *Paratopotypes:* ♂ ♀.

The only genus of Blepharoceridae hitherto recorded from Chile is *Edwardsina* Alexander, with approximately half a dozen species. The discovery of a member of the Paltostominae in the Republic is of unusual interest. The most similar species include *Curupira brevicornis* Edwards and *C. elnorae* Edwards, both of northeastern Argentina, which differ in the structure of the antenna, maxillary palpi and male hypopygium, and in all details of coloration. The simple basitarsi in both sexes of the present fly is more as in *elnorae* but there are two spurs on the posterior tibiae, the common condition in the Brazilian members of the genus. The very complex dististyle of the male hypopygium is very different from the condition found in other members of the genus.

SOME NEW NORTH AMERICAN COLLEMBOLA.

By David L. Wray, Raleigh, N. C.

In going over collections of Collembola from various parts of the country the following forms were found and are described as new in this paper.

Sinella hoffmani n. sp. (Figs. 1–2)

Length up to 3 mm. White to yellowish white with traces of rusty spots in some specimens. Eyes absent. Antennae three times length of head or as: 115 : 35, the segments as: 20 : 30 : 30 : 35. length of head or as: 115 : 35, the segments as: 20 : 30 : 30 : 35. Unguis (Fig. 1) with three inner teeth and two lateral ones. Unguiculus about three-fourths length of unguis, fringed on the outer border, lanceolate. Tenent hair reduced, two-thirds length of unguis, not knobbed. Tibiotarsi with usual rows of smooth hairs, and with 2 large subclavate fringed setae on the middle and hind legs. Third and 4th abdominal segments as: 15 : 40. Manubrium three-fourths as long as dens or as: 30 : 40. Dorsal crenulations of dens end two mucro-lengths from mucro. Mucro (Fig. 2) entomobrya-form, with two teeth and a basal spine. Scales absent. Body hairs of the usual kind, with long fringed ones and shorter plumose, reclinate hairs.

This species falls in the *curviseta* Brook group of *Sinella,* having the usual entomobrya-form mucro, but differs in having the eyes absent. It is larger in size than the North American species described. The antennae are much longer than given for *S. curviseta.*

Taken one-fourth mile inside cave where it was very abundant on bare clay. Cave at Lowmoor, Alleghany County, Virginia, March 1948, R. L. Hoffman.

Pseudosinella collina n. sp. (Figs. 3–5)

Length 1.0 mm. White but for traces of blue pigment on front of head, antennae, eyespots, and legs. Antennae heavily pigmented except base of 1st antennal joint light. Coxae heavily pigmented and legs with traces throughout. Light traces along lateral lines of body. Eyes (Fig. 4) 6 on each side, equal. Antennae slightly longer than head or as 70 : 50; proportions of segments as: 15 : 25 : 25 : 35. Body segments beginning with mesonotum as: 55 : 25 : 15 : 17 : 25 : 85 : 15 : 13; the 4th segment slightly more than 3 times the 3rd. Unguis (Fig. 5) almost straight with external tooth, and two teeth on inner margin. Unguiculus three-fourths the unguis,

lanceolate. Tenent hair weakly developed, unknobbed. Manubrium to dentes as 50:45. Mucro (Fig. 3) entomobrya-form. Rami 4-dentate, 1 basal seta.

This species is similar in general appearance to *P. candida* Fols. but differs in having only 6 eyes.

Collinsville, Illinois, Feb. 9, 1944, T. H. Frison, in ground cover.

Prospinanura n. gen.

Achorutinae in appearance and general characteristics. Mouthparts not produced in a cone. Antennae 4-segmented, shorter than head. Eyes four, two on each side of head in the only known species. Postantennal organ absent. Unguis present, unguiculus absent or tuberculate. Furcula and anal horns absent. With 8 heavy, straight spines on dorsum of last abd. segment. Color white with sparse specks and splotches of bluish pigment over body. With short, reclinate hairs over body, and with long slender hairs on 5th and 6th abd. segments.

Genotype: *Prospinanura kardosia* n. sp.

Prospinanura kardosia n. sp. (Figs. 6–10)

Length up to 1 mm. White in color with sparse specks and splotches of bluish pigment over body. Body *Achorutinae*-like in general appearance with last 2 segments narrower. Mouthparts not produced in a cone. Prothorax well developed. With at least 8 large, heavy, long, pointed spines on dorsum of last abd. segment situated 4 in anterior row, 3 in middle row, and 1 on posterior of segment (Figs. 8 and 10). Also many long, thin bristles or setae on last segment, with several on 5th abd. segment. The large bristles or setae of ventral surface of last segment are thin as other body clothing which consists of short curving hairs over body and intermingled with the larger clothing of last 2 segments. Antennae shorter than head or as 50:70, with joints as: 15:15:10:15. The last 2 antennal jts. are nearly fused, only a faint demarcation being noted ventrally. Basal 2 antennal joints swollen and much larger in diameter than last 2. With 6–8 large curved heavy sense setae on 4th ant. segment, and with a large sense bulb (Fig. 6). Eyes two on each side of head on separate spots sparsely or partially pigmented with blackish pigment. In some the anterior eye cornea seemed unpigmented. Post-antennal organ absent. Unguis untoothed, falcate (Fig. 9). Unguiculus absent or represented by a tubercle. Furcula absent.

Type locality S. Glendale, Utah. Taken from squaw bush leaves and soil by G. F. Knowlton and E. H. Kardos, April 19, 1951.

Neobeckerella n. gen.

Eyes 8 on each side on dark patches. Post antennal organ composed of a single tubercle. Furcula present but reduced and with dens-mucro much reduced. Anal horns absent. Unguis and unguiculus present. Tenent hairs present. In general appearance this genus resembles *Beckerella* Linnaniemi in that it has a single, elongate, elliptical P.A.O. tubercle, but it differs in that the unguiculus is present.

Genotype: *Neobeckerella allusa* n. sp.

Neobeckerella allusa n. sp. (Figs. 11–12)

Length 1 mm. Deep purplish blue dispersed over body, lighter beneath and at intersegmental sutures. Legs but sparsely pigmented. Eyes 8 on each side on dark eye-spots (Fig. 11). Postantennal organ a single elliptical, elongate tubercle situated in a slight pit near base of antennae. Unguis nearly straight, untoothed on inner margin. Unguiculus lamellate basally, ending in a spine (Fig. 12). Body clothing of short reclinate hairs.

Herod, Illinois, April 18, 1944, Ross and Sanderson, in ground cover.

Dicyrtomina rossi n. sp. (Figs. 13–14)

Length up to 1.0 mm. Ground color yellowish on which purple pigment is dispersed in streaks and spots, along with round light areas and spots. Laterally with irregular purple pigmented streaks; with a horseshoe-shaped streak on postero-lateral margin. Dorsally with dark streak between eyes extending down to front. Purple pigment dispersed on cheeks and vertex of head. Antennae purplish distally with lighter pigment basally on 2nd and 1st segments. Legs with but traces of pigment. Ventral tube pigmented. Eyes 8 and 8. Antennae longer than head, proportions of segments as 8:50:40:20; subsegments lacking. Claws only slightly curved, stout. Unguis (Fig. 13) with well developed tunica which reaches nearly to tip, with two inner teeth, lateral teeth, and a pair of serrated pseudonychia. Unguiculus with a tooth on the inner edge and a subapical seta which extends to end of unguis. Subanal appendage of female simple, curving. Dorsum of abdomen with sparse long hairs anteriorly and numerous short, stouter hairs posteriorly. Dentes with several simple setae dorsally. Mucro

(Fig. 14) with both margins serrate, spoon-shape.

Salem State Park, Illinois, Jan. 26, 1944, T. H. Frison, wooded hillside; Collinsville, Ill., Feb. 9, 1944, ground cover, T. H. Frison.

Isotoma persea n. sp. (Figs. 15–16)

Length up to 1.0 mm. Deep bluish-grey on a yellow background. Antennae deep blue throughout. Body with many round light spots intermingled with the pigment. Most of these light spots inclose the long setae on the body. Legs and manubrium with scattered blue pigment, dentes and mucro light. Clothing of short to moderate length setae anteriorly and with very long setae on last segment. Eyes 8 on each side on black eyespots. Post-antennal organ broadly elliptical and slightly bent in middle. Antennae a third longer than head; segments as 10:15:15:28. Unguis curving, with baso-lateral tooth and 1 distal weak inner tooth. Unguiculus (Fig. 16) lamellate at base, with inner spine, and a distal one. One knobbed tenent hair. Furcula reaches ventral tube. Manubrium with numerous ventral setae; to dentes as 2:5. Mucro quadridentate (Fig. 15), similar to *olivacea.* Tenaculum with several anterior setae.

Magnolia, Illinois, May 24, 1944, H. H. Ross, from ground cover.

Achorutes gami n. sp. (Figs. 17–19)

Length up to 0.75 mm. Body a light blue color splotched and specked over a yellow background. Venter, legs, and antennae lighter pigmented with blue. Antennae slightly shorter than head, with long curving hairs and sensory setae anteriorly; with a terminal sense bulb. Eyes 8 on each side on black spots (Fig. 19). Post-antennal organ of 4 round tubercles with a "nebenhöcker." Unguis untoothed on inner margin. Unguiculus (Fig. 18) lamellate basally and with a terminal spine. Three tenent hairs present, knobbed. Rami of tenaculum 3-dentate. Anal horns 2, very short, slightly curved, on papillae. Mucro short, somewhat truncate, to dens as 2:7 (Fig. 17). Dens with 5 dorsal setae. Clothing of short reclinate hairs and with longer ones posteriorly.

Magnolia, Illinois, May 24, 1944, H. H. Ross, in ground cover.

Achorutes magnoliana n. sp. (Figs. 20–23)

Length 1.0 mm. Body with yellow background splotched and heavily specked with dark purplish pigment, intermingled with light spots and areas. Legs, venter, and manubrium lightly pigmented. Antennae purple throughout. Antennae shorter than

head. Relative lengths of ant. jts. as 10: 10: 15: 20. With many long hairs on last 2 joints, and with several long curving sensory setae, one originating at tip. Eyes 8 on each side on dark spots (Fig. 22). Post-antennal organ consists of a quadrangular tubercle. Unguis with one tooth on inner margin near distal end. With two knobbed tenent hairs. Unguiculus absent. Mucro long and tapering; to dens as 10: 15 (Fig. 21). Dens with 4 dorsal setae. Anal horns 2, extremely minute (Fig. 23). Clothing of short, reclinate hairs and longer ones posteriorly.

Magnolia, Illinois, May 24, 1944, H. H. Ross, in ground cover; Starved Rock St. Pk. Illinois, Nov. 8, 1943, Ross and Sanderson.

Pseudachorutes rugatus n. sp. (Figs. 24–25)

Length up to 2.0 mm. Body with deep bluish pigment all over and with white spots on dorsum, under parts lighter. Antennae subequal to head, 4th segment with several large sensory hairs. Post-antennal organ (Fig. 24) with about 28–30 tubercles. Mouth cone strongly produced. Body expanded and slightly spindle-shaped. Unguis with one tooth, basally, on inner margin. Unguiculus tuberculate. Tenent hairs absent. Dentes about twice the mucro, with about 6 dorsal setae, dorsally tuberculate. Mucro (Fig. 25) only slightly curved, dorsally tuberculate. Body hairs short, sparse, and with longer downward pointing hairs on last segments.

La Rue, Illinois, April 18, 1944, in ground cover, Ross and Sanderson.

Isotoma lucama n. sp. (Figs. 26–28)

Length up to 1.0 mm. Color a pinkish-red to deep purple pigment over body with numerous light spots and areas. Antennae slightly longer than head or as 60: 50, joints as 10: 12: 12: 20. Eyes 8 on each side on dark patches (Fig. 28). Postantennal organ broadly elliptical about 3 times the diameter of an eye. Unguis untoothed on inner margin, with outer teeth (Fig. 26). Unguiculus lamellate basally, without inner tooth. Rami of tenaculum 4-dentate, with 8 setae on corpus. Body covered quite thick with moderate length hairs, longer on posterior. Manubrium half the dentes, with many dorsal and ventral setae. Dentes stout. Mucro (Fig. 27) quadridentate. 5th and 6th abdominal segments ankylosed or but faintly demarcated as in *Pseudisotoma*.

Antioch, Illinois, Oct. 27, 1943, in woody debris, Ross and Sanderson.

Genus *Spinisotoma* Stach, 1926

Body isotomine in general shape. Eyes 8 on each side. Post-antennal organ present. The 4th abd. segment subequal to 3rd, or longer than 3rd in Subgenera *Frisonia* and *Cliforga.* Furcula reaching ventral tube. The 5th and 6th abdominal segments indistinctly separated or nearly ankylosed as in above subgenera. With 4 to 8 heavy spines on the dorsum of the 5th abdominal tergit or on the ano-genital segment (5th and 6th). Dentes about twice the manubrium. Unguis present, with or without teeth. Unguiculus present. Mucro bidentate or quadridentate. Clothing of short and long hairs, and with outstanding longer, ciliate hairs on posterior abdominal segments. Pigment well developed.

Subgenus *Spinisotoma s. str.*

3rd and 4th abdominal segments subequal. 4 to 8 heavy spines in a row across dorsum of abdomen at point where 5th and 6th segments join. Mucro bi- or quadri-dentate. Long outstanding hairs, ciliate, situated posteriorly on body.

Spinisotoma (Spinisotoma) **dispersa** n. sp. (Figs. 29–34)

Length up to 0.7 mm. Color a light blue dispersed over a yellowish-gray background. Pigment in specks and spots, lighter at sutures. With small round light spots showing through pigment over body. Legs, antennae, and manubrium with pigment (Fig. 34). Eyespots black. Blue pigment heavier on a line between eyes and base of antennae, with dark interocular spot. Antennae subequal to head, the segments as 7 : 8 : 8 : 15. Eyes 8 on each side (Fig. 32), the three posterior ones almost separated from others. Post-antennal organ oval-elliptical. Unguis (Fig. 31), untoothed; unguiculus lamellate basally. Tenent hairs absent. Manubrium about half the dens. Dentes with 2 rows of dorsal setae and with many ventral ones, with a long distal spine (Fig. 29). Dens with serrations very prominent ending 2 mucro lengths from end. Mucro quadridentate. Anal spines yellow, 4 in number, long, in a line on dorsum of ano-genital segment or just at demarcation of 5th and 6th segments.

Upson County, Georgia, July 2, 6, 22, 1936, W. F. Turner; Union Co., Illinois, Sept. 18, 1936; Smith Park, Mt. Carroll, Ill., Dec. 6, 1945, Ross and Sanderson.

Subgenus *Frisonia*

4th abdomen segment longer than 3rd. Up to 8 heavy spines on dorsum of males (females lacking spines) on dorsum of ano-genital segment. 5th and 6th segments ankylosed or nearly so. Spines not situated in a single row, but in 2 or 3 rows. With long, special sensory setae near spines. Outstanding ciliate hairs present on posterior of body.

Subgenotype: *Frisonia veca* n. sp.

Frisonia veca n. sp. (Figs. 35–42)

Length up to 0.8 mm. Deep purplish-blue pigment over body through which many round and irregular light spots are evident (Fig. 35). Antennae purple throughout. Dorsum of head heavily pigmented and more so on vertex and front, with V-shape dark line. Coxae dark purple, other leg joints much lighter. Antennae subequal to or slightly longer than head; proportions of joints as 7: 10: 10: 20. Organ of 3rd segment of 2 bent sense rods (Fig. 36). Eyes 8 on each side, equal (Fig. 37). Postantennal organ consists of a broadly elliptical tubercle, 3 times the size of an eye. Unguis untoothed on inner margin. Unguiculus (Fig. 38) with spine on inner lamella. Tenent hairs wanting. Ano-genital segments ankylosed and bearing dorsally a specialized sensory field (Fig. 42); consisting of 7 large horn-like spines situated: one in center of posterior end of body, then 2 just anterior to this one, and then anteriorly an irregular row of 4, two larger lateral spines and 2 inner smaller ones. Anterior to these is a row of 7 large sensory setae. Each of these setae arise from a base consisting of specialized cells forming the sense organ. This cell area extends around posterior to the row of 4 large spines. In this area there are 6 long, curving hairs intermingled with numerous shorter hairs. Short hairs over body. Rami of tenaculum 4-dentate, corpus with 1 seta. Dentes twice manubrium, with several dorsal and lateral setae. Mucro (Fig. 39) quadridentate, with a mucronal bristle.

Collinsville, Illinois, Feb. 9, 1944, in ground cover, T. H. Frison.

Subgenus *Cliforga*

Similar to *Frisonia* but for 6 heavy spines present situated in 3 rows, the last 2 spines on posterior of 6th segment. Long outstanding smooth hairs present.

Subgenotype: *Cliforga alleghaniensis* n. sp.

Cliforga alleghaniensis n. sp. (Figs. 43–45)

Similar in general appearance to *F. veca*. Deep purplish pigment dispersed over body with round areas showing through. Antennae purplish throughout, head heavier pigmented on dorsum, with V-shape line between eyes. Dorsum of body with pigment arranged in three broken lines from mesonotum to end. Eyes 8 on each side. Post-antennal organ elongate-elliptical situated close to antennal base. Antennae subequal to head; segments as 5:8: 8:11. Unguis (Fig. 44) with lateral teeth, inner margin untoothed. Unguiculus lamellate at base, terminating with bristle. Tenent hairs absent. 4th abdominal segment longer than 3rd. On ano-genital segment are 6 heavy, yellow spines, two in a line anteriorly, then 2 smaller ones just posterior to these, and two large ones on posterior of abdomen (Fig. 43). All spines situated on large papillae. With 4 smooth long outstanding hairs situated near spines. Body clothed with short, reclinate hairs and one row of longer hairs to each body segment. Dentes and manubrium subequal. Dens with several setae dorsally and ventrally. Mucro (Fig. 45) short, quadridentate.

Type locality: Alleghany County, Virginia, Hill 4200, May 15, 1949, R. L. Hoffman; other localities, Caledonia, Illinois, June 7, 1944, M. W. Sanderson and Leighton.

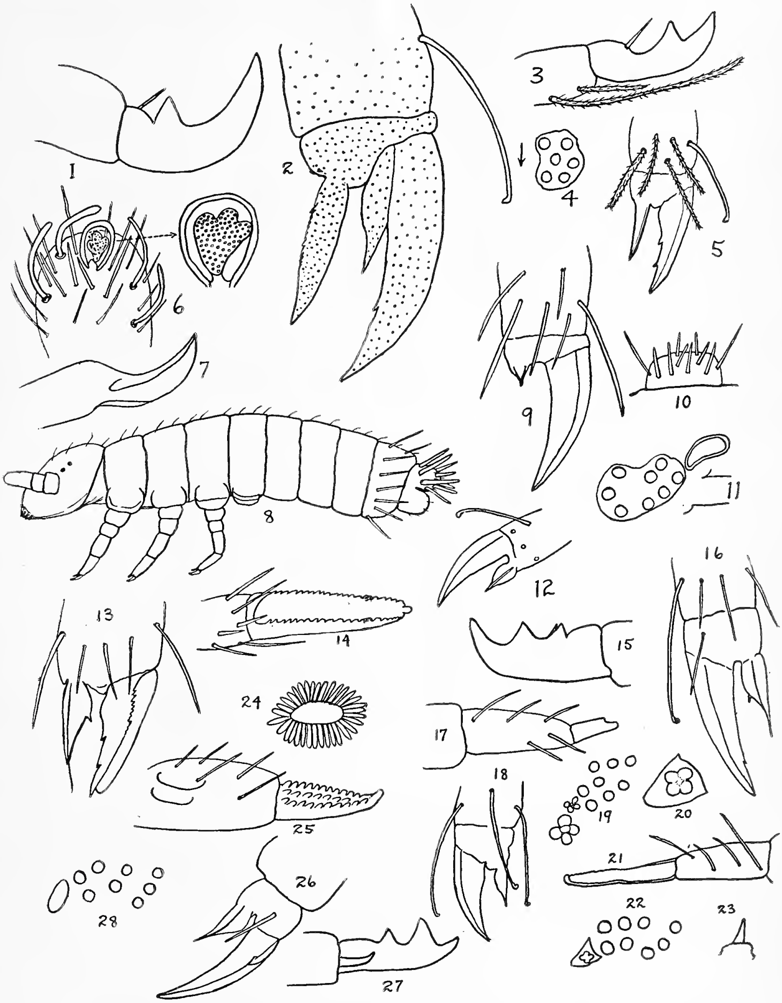
Isotomurus bemakus n. sp. (Figs. 46–47)

Length up to 2 mm. Bluish to light purplish pigment over body. Legs and venter lighter. Antennae with pigment heavier on distal part of segments. Pigment heavier on posterior of each body segment. Antennae longer than body, segments, as 30:50:55:80.

Explanation of Plate IV

Sinella hoffmani n. sp. Fig. 1. Unguis. 2. Mucro. *Pseudosinella collina* n. sp. 3. Mucro. 4. Eyes and eyespot. 5. Unguis. *Prospinaura kardosia* n. sp. 6. Antennal sense bulb. 7. Mandible. 8. Lateral view of body. 9. Left front foot. 10. End of abdomen. *Neobeckerella allusa* n. sp. 11. Eyes and postantennal organ. 12. Foot. *Dicyrtomina rossi* n. sp. 13. Foot. 14. Mucro. *Isotoma persea* n. sp. 15. Mucro. 16. Foot. *Achorutes gami* n. sp. 17. Dens-mucro. 18. Foot. 19. Left eyes. *Achorutes magnoliana* n. sp. 20. Postantennal organ. 21. Dens-mucro. 22. Left eyes. 23. Anal horn. *Pseudachorutes rugatus* n. sp. 24. Postantennal organ. 25. Dens-mucro. *Isotoma lucama* n. sp. 26. Foot. 27. Mucro. 28. Eyes.

BULL. B.E.S. VOL. XLVII PLATE IV



Eyes 8 on each side on dark patches (Fig. 46). Postantennal organ elliptical, curving and very near antennal base. Unguis long, falcate, untoothed on inner margin, with lateral teeth. Unguiculus lanceolate, nearly straight, only about half length of unguis. Rami of tenaculum 4-dentate, with several setae on corpus. Body clothing of short hairs, longer setae, and with bothriotricha on posterior of body. Dentes nearly 3 times manubrium. Mucro tridentate (Fig. 47).

Chicago, Illinois, March 24, 1941, in dwelling, W. E. McCauley.

Odontella substriata n. sp. (Figs. 48–49)

Length up to 1.25 mm. Color blue all over, lighter beneath, eyespots black. Pigment on dorsum in crossbands across middle of each body segment. Antennae shorter than head. Eyes 5 on each side. Mouth cone well developed. Postantennal organ 4–5 lobed in a deep pit (Fig. 49). Unguis broad, nearly straight, with lateral teeth, inner margin untoothed. Unguiculus absent. Two slender unknobbed hairs overhand unguis. Mucrones a third shorter than dentes, with 2 dorsal cups, and a turned up cupped apex (Fig. 49). Rami of tenaculum 3-dentate. Clothing sparse; integument tuberculate.

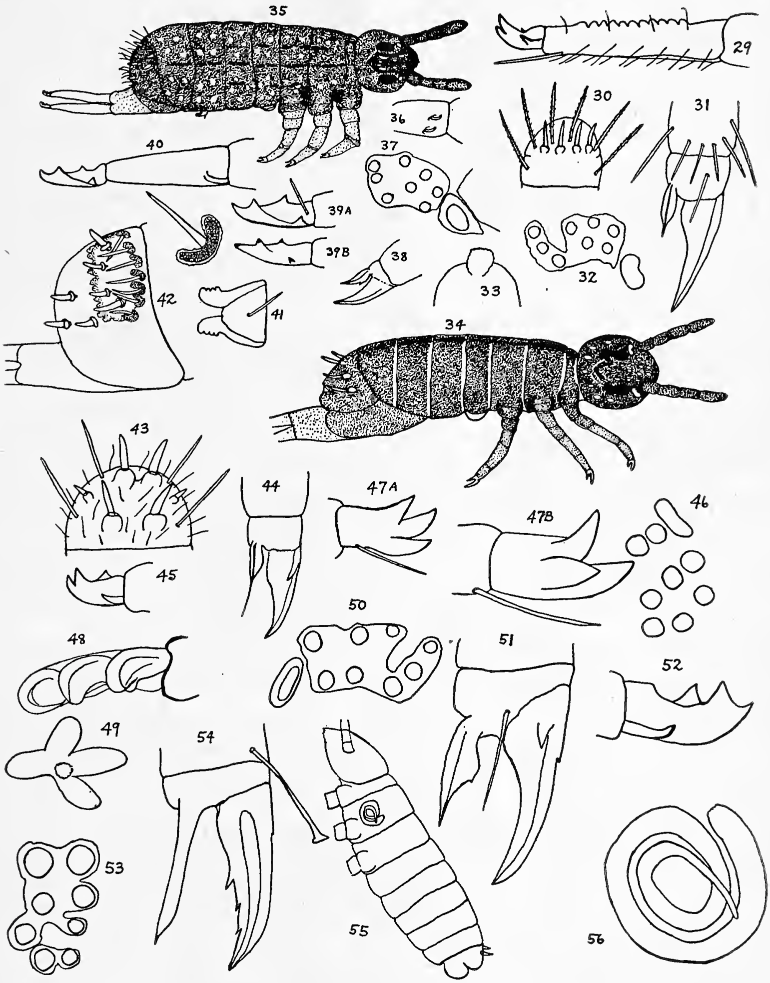
Logan, Illinois, March 7, 1945, Ross and Sanderson.

Isotoma sandersoni n. sp. (Figs. 50–52)

Length 1.3 mm. Color pinkish red all over, varying to a purplish tinge in some. Lighter beneath, on legs, and at sutures. Lighter

Explanation of Plate V

Spinisotoma (*Spinisotoma*) *dispersa* n. sp. 29. Dens-mucro. 30. End of abdomen with spines. 31. Right front foot. 32. Eyes. 33. End of antenna. 34. Lateral view of body. *Frisonia veca* n. sp. 35. Lateral view of body. 36. Organ of 3rd antennal segment. 37. Eyes. 38. Foot. 39. Mucro. 40. Mucro-dens. 41. Tenaculum. 42. Sensory field and spines. *Cliforga alleghaniensis* n. sp. 43. End of abdomen. 44. Foot. 45. Mucro. *Isotomurus bemakus* n. sp. 46. Eyes. 47. Mucro. *Odontella substriata* n. sp. 48. Postantennal organ. 49. Mucro. *Isotoma sandersoni* n. sp. 50. Eyes. 51. Foot. 52. Mucro. *Entomobrya anthema* n. sp. 53. Eyes. 54. Foot. Internal parasitic worm in *Onychiurus subtenuis,* 55 and 56, in mesothoracic position. The *O. subtenuis* was 1.5 mm. in length and the worm was estimated as being about 0.15 mm. in length uncoiled.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areas showing through. Antennae longer than head, segments as 15 : 18 : 20 : 38. Eyes (Fig. 50) 8 on each side, 2 inner ones slightly smaller. Postantennal organ elliptical, slightly elongate. Unguis (Fig. 51) with lateral teeth, inner margin untoothed. Unguiculus with or without a weak tooth on inner lamella. Rami of tenaculum 4-dentate, with 8 setae on corpus. 5th and 6th abdominal segments ankylosed or with but a faint demarcation. Dentes twice manubrium, with numerous dorsal and lateral setae. Mucro (Fig. 52) quadridentate. Clothing of numerous short hairs and a row of outstanding hairs to each segment, more numerous posteriorly.

Apple R. Can. St. Pk. Illinois, Dec. 6, 1945, Ross and Sanderson.

Entomobrya anthema n. sp. (Figs. 53–54)

Color: general yellowish background with faint traces of blue pigment dispersed over dorsum of thorax, becoming heavier on lateral margins and along line of coxae. A band of pigment around 3rd and anterior part of 4th abd. segment, broken on dorsum; a broken band on posterior of 4th segment; venter of 5th with pigment; pigment traces on legs, but a ring of pigment at distal end of femorae, especially 3rd; with pigment ringed at antennal joints, 4th joint heavier pigmented. Eyes 8 on each side (Fig. 53), the eyespots only pigmented immediately around cornea. Antennae very long, nearly as long as body, segments as 70 : 95 : 100 : 115. Furcula very long reaching to front coxae. Unguis with basolateral teeth and 3 teeth on inner margin (Fig. 54). Tenent hair large, strongly knobbed. 4th abdominal segment over 6 times the 3rd or as 190 : 30. Mucro with two teeth and basal spine, entomobrya-form. Length 2.0 mm.

Giant City St. Pk., Illinois, March 6, 1945, Ross and Sanderson.

Figures 55 and 56 show an internal parasitic worm (possibly a Nematoda?) found coiled within the lower thoracic region of a prepared specimen of *Onychiurus subtenuis*. This would indicate that Collembola as other animals would be subject to internal parasitism.

THE HYLOIDEA OF MEXICO (HOMOPTERA: CICADELLIDAE).

By ROBERT F. RUPPEL and DWIGHT M. DELONG, Columbus, Ohio.

Hyloidea was erected as a subgenus of *Dikraneura* by McAtee (1926) to include the species with much-flattened heads such as *depressa* McA. Dr. D. A. Young (1951) in his revision of the Typhlocybinae of the New World placed *Dikraneuroidea* Lawson (1929) as a synonym of *Hyloidea,* put *Erythria montealegrei* Baker (1930) into this latter genus, and recognized *Hyloidea* as a subgenus of *Alconeura* Ball and DeLong (1925). The genus as he recognizes it includes three species; *depressa* McAtee from Cuba, *montealegrei* (Baker) from Nicaragua, and *beameri* (Lawson) from the southwestern United States.

An examination of the typhlocybine leafhoppers of Mexico reveals five species which apparently belong to the genus *Hyloidea.* These species are *montealegrei* (Baker) and the new species described below as *bakeri, praeclara, candida,* and *longitudina.* Unless otherwise stated, the types of these species are in the DeLong collection.

The genus *Hyloidea* might be characterized thus: Median length of vertex greater than its basal width between the eyes, sharply angulate. Head longer and slightly wider than pronotum. Vertex flat, anterior margin sharply angled; face straight; head and body depressed. Second apical cell triangular or with a short, peduncle; apex of elytron rounded. Vannal vein of the hind-wing branches; first cubitus appearing branched (except in *beameri*); submarginal vein distinct at the apex of the wing. Male pygofers short, with dorsal hooks, plates rather short, their apices obliquely-truncated; styles similar to *Alconeura;* aedeagus with apical processes, genital orifice preapical.

Hyloidea montealegrei Baker

Erythria montealegrei Baker 1903b: 4
Alconeura (*Hyloidea*) *montealegrei* Baker, as of Young, 1951.

Color: Vertex orange-red with its lateral margins yellow and with a narrow, arched, purple band extending across its disk between the eyes. The pronotum is orange with its lateral margins yellow and with a series of anastomosing, purple spots extending across the anterior portion of its disk. The scutellum is purple with its basal angles and apex orange. The basal two-third is hyaline tinged with yellow. A spot at the base of each clavus, a pair of

anastomosing spots on each clavus near the claval suture, a broad transverse band across the middle of each corium, and a narrower arched band and the proximal half of the costal margin are purple. The face is black with its dorsal edge yellow.

Genitalia: The pygofer hook is broad, nearly straight, and is directed caudo-ventrad. A broad, flat, ventral process arises on the base of the aedeagus and curves gently dorsad; its apex is deeply cleft medially forming a pair of thin apical processes. The phalicata flares slightly near its middle, its apical margins are expanded slightly, and it curves gently dorsad.

Described from Champerico, Guatemala, and Managua, Nicaragua by Baker; specimens are at hand from Iguala, G'ro., and El Dorado, Sina Loa.

Hyloidea bakeri n.sp.

Resembling *montealegrei* (Baker) in general form and appearance, but with distinctive coloration and genitalia. Length 3.0 mm.

Color: The vertex is reddish-orange shading to deep yellow toward its apex with its lateral margins cream and with a round, median, spot on its disk and a transverse, elongate spot next each eye, purple. The face is light tan with the genae and lora cream. The pronotum is reddish-orange with its lateral margins cream and with a series of fine, large, coalescing purple spots extending across it just behind the anterior margin. The scutellum is reddish-orange with the central portion of its anterior margin and a triangular spot near the middle of each lateral margin purple. The proximal half of each elytron is reddish-orange with each distal half translucent white, the color areas separated by a row of small, purple spots which continue along the costal margin to the base of the wing. A series of purple markings are arranged on the orange portion of each elytron; a large, round spot at the base of each clavus, a spot near the center of each clavus, a small spot near the base of each commissural suture, a large spot on each clavus near the middle of the claval suture, a small, elongate, transverse bar near the apex of each clavus, a large spot on each corium near the proximal quarter of the claval suture, a transverse bar arising near the proximal third of the costal margin and extending to the inner branch of the first sector, and a series of four, round, spots arranged in a transverse row across the center of each elytron.

Genitalia: The pygofer hooks arise on the dorso-caudal angle of the pygofers, extend ventrad, are recurved, and are sharply pointed at their apices. The base of the aedeagus bears a broad, flat, ventral process which is medially bifurcate at its apex, the processes

thus formed are divergent. The phalicata is rather broad and parallel sided with its caudal margin extended into a broad lobe at its apex.

Holotype male, allotype female, male and female paratypes collected at Iguala, Gr'o., Oct. 25, 1941 by DeLong and Good. This species is named for Charles F. Baker whose work pioneered the study of the neo-tropical cicadellines.

Hyloidea praeclara n.sp.

Resembling *montealegrei* in general form and appearance, but with distinctive coloration and genitalia. Length 3.3 mm.

Color: The vertex is ivory with an inverted V-shaped, orange mark which expands laterad-basally to touch each eye with a few, small, red spots on its disc. The face is cream. The pronotum is ivory with its posterior margin bordered with orange and with scattered, small, red spots on its disc; four, round, yellow to orange spots are located just behind the anterior margin of the pronotum. A fine, longitudinal, reddish-orange stripe is located on the side of the pronotum just behind each eye. The scutellum is ivory with its basal angles yellow, its apex reddish-orange, and with small, round, red spots scattered across it. The elytra are translucent white with the proximal half of the costal margin, the area along the claval suture, and the apical cells pale yellow. A reddish-orange band extends transversely across the elytron near the base and small, red, round spots are located between this band and the base of the elytron. A broad, orange to red band which is broken to form spots along its proximal margin extends from the middle of the costal margin to the apical third of the clavus and a small, red spot is located on each branch of the first sector near the transverse veins.

Genitalia: The pygofer hooks arise on the dorso-caudad angles of the pygofers, extend ventrad, and are rather thick, a pair of long, slender, sharply-pointed, ventro-lateral processes arise at the base and extend nearly caudad to near the apices of the plates. The apex of the phalicata is extended into a curled, elongate, slender process.

Holotype male collected at Chilpancingo, G'ro., Oct. 25, 1941 by DeLong and Good; paratype female collected 10 km. north of Cuernavaca, Mor., Dec. 28, 1949 by R. H. Beamer. Holotype in the DeLong Collection; paratype in the Snow Collection.

Hyloidea candida n.sp.

Resembling *praeclara* in general form and appearance, but with distinctive coloration and genitalia. Length 3.3 mm.

Color: The vertex is pale cream with a broad, inverted V-shaped orange mark on its disk. The face is light tan. The pronotum is ivory with its posterior margin broadly bordered with orange; small, round, red spots are scattered across its anterior portion, and with a few, large, yellow spots along its anterior margin. A small, orange bar is located on the side of the pronotum behind each eye. The scutellum is ivory with its basal angles yellow and with a few, scattered, red spots. Its apex is red. The elytra are translucent white with the area along the transverse veins and a transverse stripe across the apical cells smoky. A transverse, orange stripe extends across each elytron near its base, triangular, orange mark is located on the corium near the middle of the claval suture, a small, orange spot is near the apical third of the commissural suture, and an oblique, orange stripe extends on the corium from the middle of the costal margin to the apex of the clavus. A few, red, round spots are scattered on the proximal half of each elytron and a red spot is located on each longitudinal vein just anterior to the transverse veins.

Genitalia: The pygofer hooks are rather long, slender, and sharply pointed and bear a short, blunt tooth near the middle of their dorsal margins. The phalicata widens toward its apical third and then tapers down to an attenuate apex. A reflexed process which is expanded near its apex is borne on the ventral margin near the apex of the phalicata.

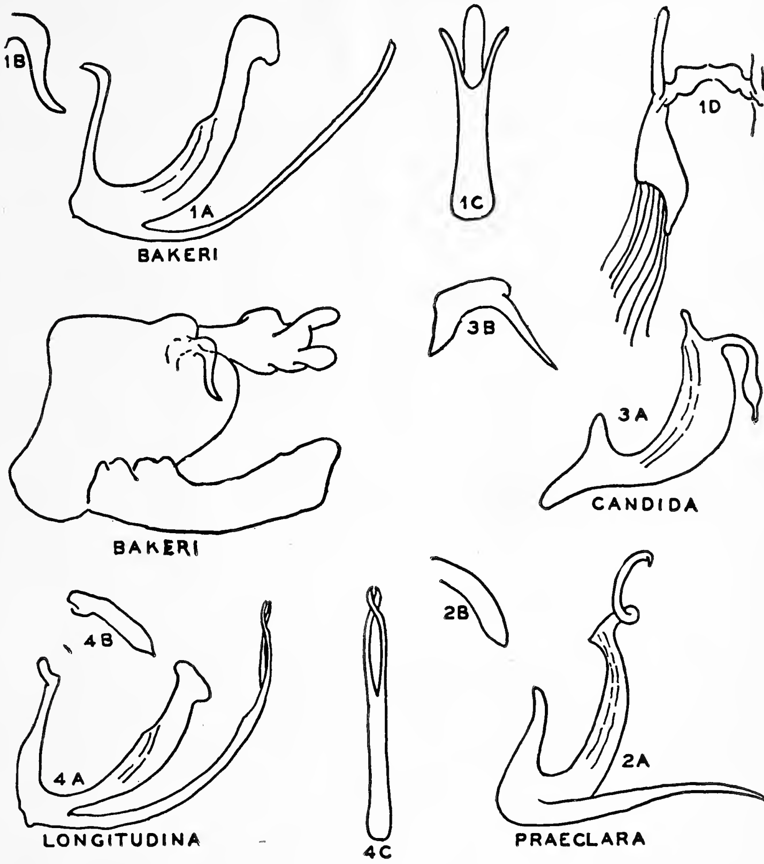
Holotype male collected at Cuernavaca, Mor., Sept. 8, 1939 by DeLong and Plummer; allotype female, 10 km. north of Cuernavaca, Mor., Dec. 28, 1949, R. H. Beamer. Holotype in the DeLong Collection and allotype in the Snow Collection.

Hyloidea longitudina n.sp.

Resembling *candida* in general form and appearance, but with a distinctive color pattern and with the base at the third apical cell but one-fourth as wide as the base of the posterior apical cell. Length 3.4 mm.

Color: The vertex is orange with its lateral margins, a median, longitudinal line on its disc, and a small spot next each eye, cream. The face is light tan with its anterior portion light orange and with a fine, red, line above antennal pit. The pronotum is cream with a few, small, red spots along its posterior margin and with paired, lateral and medial, longitudinal, broad, orange vittae extending across it, the medial vittae fusing together on the disc. An orange line is located on the sides of the pronotum just behind each eye. The scutellum is red with its basal angles yellow and with its mar-

BULL. B.E.S. VOL. XLVII PLATE VI



EXPLANATION OF PLATE

1.—*Hyloidea bakeri*—lateral view of genital capsule; 1a—lateral view of aedeagus; 1b—dorsal pygofer hook; 1c—caudal view of aedeagus; 1d—ventral view of style. 2a—*H. praeclara*—lateral view of aedeagus; 2b—dorsal pygofer hook. 3a—*H. candida*—lateral view of aedeagus; 3b—dorsal pygofer hook. 4a—*H. longitudina*—lateral view of aedeagus; 4b—dorsal pygofer hook; 4c—caudal view of aedeagus.

gins and a spot near its center cream. The elytra are translucent white with the veins of the apical cells slightly enbrowned and with a round, black spot between the sectors near the base of the posterior apical cell. The area along the commissural suture and the apical cells are light yellow and small, round red spots are scattered across the clavus and the proximal two-thirds of the corium. A large, wedge-shaped, orange mark is located near the base of each clavus, a small, rounded, orange spot is present near the apex of each clavus, an oblique, orange band extends from the proximal third of the costal margin to the claval suture, and an interrupted, orange band extends from the middle of the costal margin to the apex of each clavus.

Holotype female collected 10 km. north of Cuernavaca, Mor., Dec. 28, 1949 by R. H. Beamer. Type in the Snow Collection.

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CONTENTS

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BULLETIN

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MALES OF THE GENUS HYLEMYA *SENS. LAT.* FROM NORTH AMERICA, HAVING DORSAL BRISTLES ON MID METATARSUS, WITH DESCRIPTIONS OF NEW SPECIES, (MUSCIDAE, DIPTERA).

By H. C. Huckett, Riverhead, N. Y.

The purpose of this paper is to bring together for comparative study the males of North American species belonging to the genus *Hylemya sens. lat.* in which the setae or bristles on dorsal surface of mid metatarsus are known to occur in a more or less prominent series, e.g., *Hylemya liturata* (Meigen) (= *trichodactyla* Rond.). This character was taken by Karl[1] to delimit a new subgenus, Tricharia, in a classification based on the German fauna, and was employed later by Ringdahl[2] in a study of the males of such species belonging to the Swedish fauna.

In dealing with native forms the actual merits of this character for taxonomic purposes is not as inclusive as may seem apparent on first acquaintance or when making a restricted study. Abnormalities and variations occur in species of wide distribution or that are present in regions of high altitude or in northern latitudes as the following remarks would indicate.

In the following species this male character has invariably appeared in its typical form as a serial row of bristlelike setae, namely, in *H. liturata* (Meigen), *fabricii* (Holmgren), *propinquina* and *garretti* Huckett, *curvipes* Malloch, *setitarsata* Huckett, *attenuata* Malloch, *armata* (Stein), and in the following five species to be described herein, *H. extenuata, lamellicauda, montivagans, setiseriata, simulata.*

[1] Karl, O. 1928. Die Tierwelt Deutschlands, XIII Pt. 3 p. 160.

[2] Ringdahl, O. 1949. Bemerkungen zu einigen Delia-Arten Muscidae). Opus. entom., XIV (1): 49–52, figs. 1–20.

In *H. alaba* (Walker) and *H. gracilipes* Malloch the character may be present or absent, and when present is represented in most specimens by a few short setae proximad. The species *H. neomexicana* Malloch is included on the strength of one aberrant male specimen that came to my notice in which the mid metatarsal character was fully developed.

In *H. cilicrura* (Rond.), as earlier reported by Malloch[3] concerning specimens from Patagonia and South Chile, the character may be rendered ambiguous due to the occasional development of longish setulae on dorsal surface of mid metatarsus. Ringdahl,[2] for apparently similar reasons, felt it advisable to include the two species *H. subalpina* and *H. elymi* in his key to Swedish species possessing this character.

In the few males that I have examined belonging to *H. ineptifrons, setiventris extensa,* and in *vesicata* later to be described, the dorsal surface of mid metatarsus is clothed with a similar series of longish setulae, a condition that I consider atypical, but which on account of the prominence of the setulae I have felt obliged to take into consideration for the purposes of this study.

The males of all these species except *curvipes, setitarsata, neomexicana,* have a bluntish apical bristle on posteroventral surface of fore tibia. All the species without exception would come within the subgenus Delia (Rob. Desv.) as outlined by Ringdahl.[4]

The females of the foregoing species are not as readily segregated for taxonomic purposes as the males, and hence their elucidation had better be deferred until a wider study can be made of all species belonging to the genus.

Key to Males

1. Dorsal or upper surface of hind metatarsus setose, and likewise on segments 2, 3 and 4; distal half of mid tibia with 10 or more bristles on dorsal aspect . . . *setitarsata* Huck.
   Dorsal surface of hind tarsal segments not setose 2
2. Fourth abdominal sternum deeply emarginate caudad, laterocaudal angles produced as lamellae or processes, bearing numerous very long bristles 3

[3] Malloch, J. R. 1934. Diptera of Patagonia and South Chile. Part VII Fasc. 2 Muscidae. British Museum (Natural History) pp. 179, 187.

[4] Ringdahl, O. 1933. Översikt av i Sverige funna Hylemyia-Arter. Entom. Tidskr., LIV (1) : 21–26.

Fourth sternum not emarginate caudad nor lamelliform at laterocaudal angles 4

3. Eyes widely separated apart as in female, and frons so bristled; hind tibia with a robust apical posterodorsal bristle. *ineptifrons* Huck.

Eyes not widely separated nor frons bristled as in female; hind tibia with a weak apical posterodorsal bristle. *setiventris extensa* Huck.

4. Second fore tarsal segment with a wartlike swelling on anterior surface; fifth fore tarsal segment with 2 or 3 stiff strong apical bristles; cerci with long fasciculate setae that reach to base of abdomen; prealar bristle as long as anterior notopleural bristle .... *vesicata* n. sp.

The above characters lacking; prealar bristle shorter than anterior notopleural bristle; second fore tarsal segment not swollen 5

5. Cerci formed as a reddish flat horizontal plate over the gonostyli, distal margin densely fringed with slender black setae; mid and hind femora broadly yellowish on distal half .... *lamellicauda* n. sp.

Cerci restricted largely to basal region between the gonostyli and gradually tapering apicad; distal half of femora largely blackish 6

6. Hind femora decidedly slender and upwardly bowed; hind legs much longer and more slender than middle legs, 1.5 times as long .... *curvipes* Mall.

Hind femora not bowed, and of normal proportions 7

7. Inner margin of processes (lobes of fifth abdominal sternum) with several stout blunt setulae from base to apex; mid tibia with 2 posterodorsal bristles; fore tibia with a fine pointed apical posteroventral bristle . *neomexicana* Mall.

Inner margin of processes with bluntish setulae restricted to apex, or absent; mid tibia with 1 posterodorsal bristle or none; fore tibia usually with a bluntish apical posteroventral bristle 8

8. Hind femur with a continuous entire series of fine erect bristles along distal half of posteroventral surface 9

Hind femur lacking an entire continuous series of short erect bristles along distal half of posteroventral surface, if bristles are present they are not in an even extensive series for the entire distal half, or may be of a spurious nature 10

9. Processes with a short series of black spinules at apex of inner margin; disc of mesonotum and scutellum blackish, presutural region of mesonotum trivittate .. *setiseriata* n. sp.
   Processes at most with only a single weak seta at apex of inner margin; disc of mesonotum and scutellum pale gray or suffused with brownish infuscation, presutural region not trivittate .... *liturata* (Meig.)
10. Hind tibia with posteroventral surface fringed with semierect setulae usually for nearly the entire distance. *cilicrura* (Rond.)
    Hind tibia with only a partial restricted series of posteroventral setulae 11
11. Abdomen slender, terga 1 + 2, and 3, each longer than wide as viewed from above, sternum 3 three times and sternum 4 twice as long as wide; presutural acrosticals uniserial or absent 12
    Abdominal terga 1 + 2, and 3, each not longer than wide; sterna 3 and 4 shorter respectively than the foregoing dimensions; presutural acrosticals in paired series 13
12. Second and third mid tarsal segments much flattened dorsoventrad, at widest exceeding maximum width of fifth tarsal segment, posterior apical thorns robust, as long as segment 3, anterior apical thorns minute; prealar bristle present; tips of apical bristles on processes not extending beyond apex of abdomen .... *attenuata* Mall.
    Second and third mid tarsal segments not broadened nor appressed dorsoventrad, at widest not broader than maximum width of fifth tarsal segment, posterior apical thorns shorter than length of segment 3, anterior apical thorns normal, not minute; prealar bristle absent; tips of apical bristles on processes extending beyond apex of abdomen. *extenuata* n. sp.
13. Apical spinules on inner margin of processes fully as long as or longer than width of process near apex; posterior apical thorns of mid tarsal segments 3 and 4 elongated, longer than that of segment 1, except in *fabricii* 17
    Apical spinules on inner margin of processes shorter than width of process near apex, or are absent; posterior apical thorns of mid tarsal segments 3 and 4 normal, scarcely longer than that of segment 1 14
14. Marginal bristles of cerci longer than arista, sparse and notably flaccid and curling; longer aristal hairs about three

times as long as basal diameter of arista; mid metatarsal series of dorsal bristles vestigial .... *alaba* (Walk.)

Marginal bristles of cerci normal, shorter than arista; aristal hairs not longer than twice basal diameter of arista; mid metatarsal series of dorsal bristles well developed ... 15

15. Thorax black or deep seal brown; proboscis polished and glossy 16

Thorax partly grayish or cinereous (disc of mesonotum and scutellum occasionally suffused with brownish markings); proboscis lightly pruinescent .... *simulata* n. sp.

16. Mesonotum and scutellum shiny, abdominal terga with silky sheen; parafacials in profile at narrowest width slightly less than half length of third antennal segment. *armata* (Stein)

Mesonotum, scutellum and abdominal terga dull, nonshiny; parafacials at narrowest width slightly more than half length of third antennal segment .... *montivagans* n. sp.

17. Mid metatarsal dorsal series of bristles vestigial, setae scarcely longer than diameter of mid tibia at apex. *gracilipes* Mall.

Mid metatarsal dorsal series of bristles well developed, longest setae twice as long as diameter of mid tibia at apex .. 18

18. Ninth tergum (anal sclerite) with a close assemblage of stiffish setulae along ventral border, that are directed ventrad; cerci tapering on distal half to slender dimensions, the apical setulae becoming minute, not as long as the blunt apical spinule on inner margin of process 19

Ninth tergum with a few sparse setulae on ventral border; cerci with apical setulae slender and longer than apical spinule on inner margin of process 20

19. Hind tibia usually testaceous, paler than hind femur; processes with one stout blunt spinule at apex of inner margin. *gracilipes* Mall.

Hind tibia usually brownish tinged, concolorous with hind femur; processes with 2 fine spinules at apex of inner margin .... *fabricii* (Holmgr.)

20. Cerci small, cordate, with numerous longish curling setulae at apex; processes usually with 2 or more blunt spinules at apex of inner margin, and with a straight longish apical bristle directed caudomesad .... *garretti* Huck.

Cerci arrowshaped and with only a few slender setulae at apex; processes usually with one blunt spinule at apex

of inner margin, and devoid of any such longish bristle at apex .... *propinquina* Huck.

Hylemya (*Delia*) **extenuata** n. sp.

Male; grayish drab tinged with brown; interfrontalia with a dull reddish patch across base of antennae, parafacials with a velvety pruinose mark near base of antennae, the latter black, palpi brownish, proboscis lightly pruinescent. Mesonotum with a faint brownish dorsocentral vitta and disc of scutellum with a median brownish subtriangular marking when viewed from behind. Abdominal vitta brownish, linear, with each tergal section successively broader caudad. All femora blackish, fore, mid and hind tibiae reddish brown, with each successive pair cephalad becoming darker or more completely fuscous. Wing membrane uniformly tinged throughout, cross veins clear and with no trace of clouding; calyptrae paler, halteres dull yellow and more or less suffused with purple.

Eyes separated at narrowest width of frons by a distance about equal to diameter of anterior ocellus, 4 to 8 pairs of slender parafrontal bristles cephalad, parafacials in profile at base of antennae fully as wide as breadth of third antennal segment, becoming restricted at a level with middle of face; cheeks broad and well maintained caudad; antennae proportionately small, apex of third segment reaching a level at two thirds length of face; arista minutely haired. Mesonotum sparsely setulose, acrostical bristles sparsely arranged and weakly developed, uniserial cephalad, prealar bristle absent, sternopleural bristles arranged 2 : 2, the ventral bristle of anterior pair weak. Abdomen slender and narrow, depressed, longer than thorax, sides subparallel, segments 1 + 2 and 3 as seen from above each longer than wide, hypopygium inconspicuous, processes with dense slender bristles on outer surface, tips of those at apex of processes reaching caudad of apex of abdomen.

Legs slender, fore tibia with a mid and a blunt apical posteroventral bristle; mid femur lacks a preapical anterior bristle; mid tibia with 2 or 3 posteroventral bristles, mid anterodorsal and posterodorsal bristles lacking; hind femur with a series of 6 or 7 anteroventral bristles extending to proximal half, posteroventral surface bristleless; hind tibia with 3 or 4 anteroventral, 4 anterodorsal, 3 posterodorsal, and a sparse series of weaker posteroventral bristles on proximal half. Mid metatarsus with a dorsal series of longish setae, mid tarsal segments 2, 3 and 4 not notably broadened and apical thorns on posterior surface not notably long. Cross

vein *m–cu* erect.

Female similar to male except for sexual characters, differing in that interfrontalia, parafacials and cheeks are largely reddish suffused, second antennal segment reddish at apical margin, abdominal vitta lacking or poorly defined; ventral surface of apical region of femora more or less reddish tinged; caudal pair of ocellar bristles longish and curved outward, prealar bristle present and short, abdomen of normal proportions. Fore tibia with 1 mid anterodorsal and 1 mid posteroventral bristle, mid femur with a preapical anterior bristle, mid tibia with 1 anteroventral, 1 anterodorsal, 1 posterodorsal and 2 posteroventral bristles. Length 6.25–6.5 mm.

Holotype and allotype: ♂, ♀, Chehalis, Washington, VIII.25.11. [U.S.N.M.]

Paratype: ♂, Marys Peak, Benton County, Oregon, VIII.18.40 (R. E. Rieder).

The species *extenuata* and *attenuata* are similar; the chief differences between males are given in the key. Although such distinctions are striking in the few specimens that I have seen it is felt that their ultimate value for specific purposes may well depend on the findings resulting from an examination of a richer series of specimens than is now available for study.

Hylemya (*Delia*) **lamellicauda** n. sp.

Male; pale grayish, parafacials silvery pruinescent, cheeks duller; antennae blackish, second segment reddish tinged at apex, palpi brownish, proboscis lightly pruinescent. Mesonotum with trace of dorsocentral and sublateral vittae, discal region occasionally brownish tinged; abdomen with uniformly narrow dorsocentral vitta, cerci reddish tinged; fore femur largely blackish, mid and hind femora yellowish or more or less partly black, all tibiae yellow. Wings and calyptrae clear or slightly tinged, halteres yellow.

Eyes separated at narrowest width of frons by a distance equal to diameter of anterior ocellus, parafrontals contiguous caudad, parafacials at base of antennae about as wide as breadth of third antennal segment, narrower ventrad, aristal hairs slightly longer than basal diameter of arista. Mesonotum with one well developed middle pair and two weaker pairs of presutural acrostical bristles, prealar bristle short, sternopleural bristles arranged 1 : 2. Abdomen depressed, sides subparallel, tapering caudad, cerci prolonged as a spatulate horizontal plate gradually widening distad, the rounded caudal margin densely fringed with black slender setae.

Fore tibia with usually 1 mid posteroventral, and a stout blunt apical posteroventral bristle; mid femur lacks a preapical anterior bristle, mid tibia with 2 posterodorsal and 2 posteroventral bristles, all short, anterodorsal surface bristleless; hind femur with 5 to 7 anteroventral bristles on distal three fifths, posteroventral surface bristleless, hind tibia with 3 or 4 anteroventral, 4 or 5 anterodorsal, 3 posterodorsal, and a partial series of weaker posteroventral bristles, apical posterodorsal bristle setulose. Mid metatarsus with a dorsal series of long setae; mid tarsal segments 2, 3 and 4 with elongated apical thorns on posterior surface.

Female similar to male except for sexual characters, anterior region of interfrontalia, parafacials and cheeks usually suffused with reddish coloration, palpi reddish basad; abdominal dorsocentral vitta weak; fore femur broadly yellowish on distal half, mid and hind femora largely or entirely reddish yellow; cruciate bristles well developed, ovipositor with recurrent spinules on terminal sclerites; fore tibia with a mid anterodorsal bristle, mid femur with a preapical anterior bristle, mid tibia with a strong mid anterodorsal bristle, hind tibia with 2 or 3 anteroventral, 4 anterodorsal, 3 posterodorsal bristles. Length 6 to 6.5 mm.

Holotype: ♂, Williams, Arizona, VI.15.– (H. S. Barber). [U.S.N.M.]

Allotype: ♀, Cedar Valley, Utah, X.9.40 (H. F. Thornley). [U.S.N.M.]

Alberta: ♀, Waterton, VIII.13.22 (H. E. Gray). [C.N.C.]

California: ♂, Lone Pine, VII.28.40 (R. H. Beamer), ♂, Bishop, VII.28.40. (L. J. Lipovsky). [Univ. Kans.]

Colorado: ♀, Cameron Pass, Medicine Bow Range, VIII.23.40 (D. G. Hall). [U.S.N.M.]

Idaho: ♂, 11 mi. N. of W. Springs, VIII.3.50 (R. R. Dreisbach).

Nevada: ♀, Ely, VIII.13.40 (L. J. Lipovsky). [Univ. Kans.]

Oregon: ♂, Vale, VI.22.02 (Wicklund).

Utah: ♂, Juab, VI.14.35 (G. F. Knowlton), ♀, Currant Creek, VIII.16.40 (Knowlton & Nye), ♀, Logan, VIII.20.38. 3 ♀, Cedar Valley, IX.25–26.40 (H. F. Thornley).

Washington: ♂, Wenatchee, V.28.40. 2 ♂, Rock Island, V.16–26.40.

Wyoming: ♀, Hanna, VIII.25.40 (Knowlton & Nye).

The species *lamellicauda* is related to *montana* Malloch, the male of the latter having no bristles on dorsal surface of mid metatarsus. The striking character of the cerci in males of *lamellicauda* serves

to distinguish them from any others known to me in the genus.

Hylemya (*Delia*) **montivagans** n. sp.

Male; blackish, parafacials and cheeks seal brown with or without a reddish tinge, lightly pruinescent; antennae blackish, palpi brownish, proboscis polished; mesonotum and scutellum deep seal brown, the former with trace of three darker vittae, humeral and notopleural callosities paler. Abdomen with a series of extensive brown subtriangular dorsocentral marks, each of which is dilated anteriorly along border of tergum, lateral areas grayish drab or paler brownish pruinescent, hypopygium subshining. Legs brownish, tibiae concolorous or paler than femora. Wings faintly tinged or clear, calyptrae tinged, halteres yellow.

Eyes at narrowest width of frons separated by a distance about equal to diameter of anterior ocellus, parafrontals contiguous caudad; bristles and setulae of head fine and slender; width of parafacials and cheeks well maintained, at narrowest dimension nearly equal to width of third antennal segment, second and third segments of antennae lying well spaced apart owing to a median facial elevation, ventral border of face flexed forward; arista minutely haired, proboscis slender. Mesonotum with a stronger median pair of presutural acrostical bristles and two weaker pairs, prealar bristle short; sternopleurals arranged 1 : 2. Abdomen depressed, sides subparallel, slightly narrower caudad, hypopygium thickened, proccesses weakly bristled.

Fore tibia with 1 mid and a blunt apical bristle on posteroventral surface; mid femur with a series of weak bristles on prebasal region of anteroventral surface, and with a series of longish bristles on proximal two thirds of posteroventral surface, mid tibia with 1 mid anterodorsal, 1 posterior, 1 posteroventral bristle, all fine and short; hind femur with an extensive series of anteroventral bristles, those on proximal half much shorter, posteroventral surface with 2 or 3 fine sparse bristles on distal half in addition to preapical setulae, hind tibia with 5 to 7 anteroventral, 5 anterodorsal, 3 or 4 posterodorsal bristles, and a partial median series of posteroventral setulae. Mid metatarsus with a series of long dorsal setae. Cross vein *m–cu* erect.

Female paler than male, parafrontals, occiput and anterior border of mesonotum bluish gray, interfrontalia, parafacials and cheeks largely reddish. Mesonotum with three vittae, abdomen cinereous or brownish tinged with dorsocentral vitta lacking; lower bristle of caudal pair of sternopleurals very weak. Fore tibia with a mid

anterodorsal bristle; mid femur devoid of anteroventral bristles, mid tibia with a weak anterior, 1 robust anterodorsal, 1 posterodorsal, 2 posteroventral bristles; hind femur with anteroventral bristles restricted to distal half, posteroventral surface bare, hind tibia with 2 or 3 anteroventral, 4 anterodorsal, 3 posterodorsal bristles. Otherwise similar to male except for sexual characters. Length 4.5 mm.

Holotype: ♂, Tennessee Pass, Colorado, 10,240 ft. alt., VII.11.– (J. M. Aldrich). [U.S.N.M.] Allotype: ♀, Kenosha Pass, Colorado, VIII.1.38 (James & Lanham). [U.S.N.M.]

Colorado: ♂, ♀, Red Mountain, 11,000 ft. alt., VII.22.34 (Alexander). ♂, Gunnison County, E. Maroon Pass, VII.27.47 (C. L. Hayward).

Montana: ♂, Beaver Creek, 6,300 ft. alt., VIII, 1913 (S. J. Hunter).

Utah: ♂, Atwood Lake, Uinta Mts., Duchesne County, VIII.27.45 (C. L. Hayward). 3 ♂, 5 ♀, Roberts Pass, 12,500 ft. alt., Uinta Mts., Duchesne County, VII.9.46.

This delicate species is characterized by slender bristling and vestiture, particularly in male, by a proboscis of slender proportions, by parafacials whose width is well maintained ventrad, the anterior margin being straight, not dished or concave, and further in that the vibrissal angle is slightly accentuated by a flexing forward of oral margin so that it reaches a level with base of antennae.

(To be concluded in the February issue.)

Bedbugs in Swallow Nests.—Bedbugs were found to be numerous in nests of barn swallows at one place in the Uinta Basin. These nests were built on large sandstone rocks in a rough area at the north end of Pleasant Valley, Duchesne County, Utah. These active bedbugs proved to be *Oeciacus vicarius* Horvath (determination by Dr. R. I. Sailer). The swallow nests also contained a number of mites. L. L. Hall, F. V. Lieberman, Dr. G. E. Bohart and I examined these nests. Barn swallow nests collected at Randolph, Utah, during summer of 1951 contained great numbers of the mite, *Dermanyssus gallinae* (DeGeer) (determination by Dr. E. W. Baker).—G. F. Knowlton, Logan, Utah.

FOUR UNDESCRIBED MOTHS FROM EASTERN NORTH AMERICA, WITH NOTES ON CLOSELY RELATED SPECIES (LEPIDOPTERA, PHALAENIDAE *OLIM* NOCTUIDAE).

By J. G. Franclemont, Washington, D. C.

The four species of noctuids described at this time to make the names available for use in the Third Part (Noctuidae) of the Lepidoptera of New York and Neighboring States, soon to appear, have been confused, in most collections, with well known and closely related species.

Phalaeninae (*olim* Agrotinae, *recte* Noctuinae)

Euagrotis lubricans (Guenée)

Noctua lubricans Guenée, Histoire Naturelle des Insectes, Species Général des Lépidoptères, vol. 5 (Noctuélites 1), p. 323, Noctuélites pl. 5, fig. 7, 1852.
Type locality: "Floride."
Location of type: British Museum (Natural History).

Mamestra associans Walker, List of the Specimens of Lepidopterous Insects in the Collection of the British Museum, part 15, p. 1683, 1858.
Type locality: "East Florida."
Location of type: British Museum (Natural History).

Noctua spreta Smith, Jour. New York Ent. Soc., vol. 10, p. 36, 1902.
Type locality: "Hastings, Florida."
Location of type: Rutgers University.

Euagrotis lubricans (Guenée) and *E. illapsa* (Walker) show no constant tangible differences in the genitalia of either sex. I would consider them races of one species, if it were not for the marked differences in appearance, *illapsa* with translucent white hind wings, *lubricans* with smoky fuscous brown ones, *illapsa* with the overall pattern more sharply defined, and if it were not for the different ranges, that of *illapsa* from Texas and Florida to Ontario and Quebec, and that of *lubricans* from Florida and the Gulf States to North Carolina, with that of *illapsa* overlapping the entire range of *lubricans*. The answer to their true relationship will only come when some careful field worker collects both forms through several seasons and rears them side by side.

E. lubricans is double brooded at Raleigh, North Carolina, and

probably triple or more brooded further south. The moth was not uncommon at bait during late March and early April at Daleville, Alabama, in the spring of 1943.

Male genitalia as figured. (Figures 1 and 1A.)

Female genitalia as figured. (Figure 4.)

Euagrotis illapsa (Walker)

Graphiphora illapsa Walker, List of the Specimens of Lepidopterous Insects in the Collection of the British Museum, part 11, p. 744, 1857.

Type locality: "St. Martin's Falls, Albany River, Hudson's Bay."

Location of type: British Museum (Natural History).

Walker's type of *illapsa* is a rather small female specimen, expanse 29 mm., somewhat water stained and with the abdomen unfortunately missing; however, the general habitus and pattern of the specimen leave no doubt as to its identity. It is a fully marked specimen, as fully as found in this species, with the ordinary lines blackish, and the hind wing somewhat darker than usual, but this can be matched by specimens before me. As stated in the discussion of *lubricans,* the range of this species covers almost the entire temperate part of eastern North America. It is double brooded at Ithaca, New York, and at Arlington, Virginia.

Male genitalia as figured. (Figure 2.) The figures of the valves of *lubricans* and *illapsa* show the total differences that can be expected; usually specimens do not exhibit the degree of difference shown by the two chosen for illustration.

Euagrotis forbesi n. sp.

This species resembles *illapsa* (Walker), but is distinctly larger, has a more powdery appearance, and the markings are more blurred and less distinct; it is slightly larger than *lubricans* (Guenée) and differs by the translucent white hind wing in both sexes. The male genitalia differ from both *illapsa* and *lubricans* by having a single, short, blunt spine on the vesica, absent in those two species, by having a weak digitus on the valve, also lacking in *lubricans* and *illapsa,* and by having the margins of the valves almost parallel.

Head and thorax whitish blue-gray with some rosy or brown tints; the collar with a wide, black, basal band. Forewings concolorous with thorax, the ground color overlaid with a mixture of rosy, blackish and brownish scales, varying in intensity and emphasis with individual specimens; the ordinary markings vague and blurred, hardly discernable in most specimens, the five, black, tri-

angular costal spots on each wing, representing the inception of the transverse lines, very prominent; about half the specimens with the reniform outlined on outer and lower sides by black, the others with only a vague or no indication of the reniform; orbicular absent; the t. a. and t. p. lines very vague, their paths indicated by some dark or pale scales in a few specimens. Hind wings in the male translucent white with a narrow fuscous border, wider toward costa; in the female translucent white heavily infuscate, the base lightest and the outer margin darkest; fringe in both sexes white.

Expanse: 38–42 mm.

Male genitalia as figured. (Figures 3, 3A and 3B.)

Female genitalia as figured. (Figure 5.)

Type: Male, Claremont, New Hampshire, July 10, 1911, in the U. S. National Museum Collection. USNM Type No. 61477.

Paratypes: 1 male, Meach Lake, Ottawa Co., Quebec, July 8–14; 1 male, Oldtown, Maine; 2 males, Newton Highlands, Massachusetts, W. Barnes; 1 male, Bear Mountain, New York, H. J. Erb; 1 male, Bethlehem, Pennsylvania, July 24 (*ex* Doll Collection); 1 male, Lititz, Pennsylvania, J. J. Heiserman; 1 male, White Mills, Pennsylvania, August 20 (*ex* Doll Collection); 1 male, Louisville, Kentucky, July 21, B. Nettelroth (*ex* Doll Collection); 1 female, Newton Highlands, Massachusetts, W. Barnes; 1 female, Concord, Massachusetts, July 21, 1913, William Reiff; 1 female, Franklin Co., New York, July 1886, C. S. McKnight (*ex* Doll Collection); 1 female, Hudson, New York, July 6 (*ex* Doll Collection); 1 female, Allegany State Park, New York, July 24, 1937, R. Shadle; 1 female, Skyland, Virginia, July 6, 1911, H. G. Dyar; 1 female, Louisville, Kentucky, July 6, B. Nettelroth (*ex* Doll Collection); 1 female, Houston, Texas, July 10 (*ex* Doll Collection); all in the Collection of the U. S. National Museum. 1 male, Bear Mountain, New York, H. J. Erb; in the Collection of Cornell University, Department of Entomology. [The data on specimens from the Doll Collection cannot always be trusted, and I doubt very much that the specimen bearing the Houston, Texas, label actually came from there because other specimens from the Doll Collection with this locality have proved to be incorrectly labelled. The locality Louisville, Kentucky, should also be viewed with skepticism; the two specimens probably came from much further east in the state.]

This species is named in honor of Professor W. T. M. Forbes, of Cornell University.

Hadeninae

Leucania linda n. sp.

This species is similar to *Leucania anteroclara* form *calgariana* Smith in general appearance, but it has the specializations of the

phragmatidicola-commoides group. This species will key to *phragmatidicola* Guenée in Hampson, Catalogue of the Lepidoptera Phalaenae in the British Museum, vol. 5, p. 482, 1905, and has been confused with that species in collections. It may be separated from *phragmatidicola* by the darker, more reddish and more striated forewing, and by the more fuscous hind wing with the veins dark scaled. The male genitalia have the cucullus of the valve more elongate and narrower, and the uncus broader and different in shape.

Head and thorax pale, luteous fawn color with some reddish brown powdering, most evident in second brood specimens; the collar with three more or less prominent, dark, grayish transverse lines; the patagia with a longitudinal gray line near inner margin. The forewings concolorous with the thorax, overlaid and strongly streaked with reddish shades, the veins whitish with accompanying dark streaks on each side; the basal section of Cu (so-called Median) strongly whitish, and enlarging into a spot at the point of separation of Cu_1, M_3 and M_2, with a small black point resting on the white spot or in the upper part of it, the dark streaks above and below Cu often very conspicuous and often strongly blackish; usually with a small black point below at about middle of streak; a series of black points, in the interspaces, forming an excurved arc from costa to inner margin at about outer fifth of wing. All ordinary lines and spots absent. Hind wing translucent white, strongly shaded with fuscous, especially toward the outer margin, the whole wing darker in the female.

Expanse: First brood, 36–41 mm.; second brood, 31–36 mm.

Male genitalia as figured. (Figures 6 and 6A.)

Female genitalia as figured. (Figure 8.) The ductus bursae not as long as in *phragmatidicola*.

Type: Male, Arlington, Virginia, 9 June 1948, J. G. Franclemont, in U. S. National Museum Collection (*ex* Franclemont Collection), USNM Type No. 61478.

Paratypes: 52 males and 60 females, first brood, Arlington, Virginia, 21 May–18 June, 1948–51; 59 males and 87 females, second brood, Arlington, Virginia, 26 July–15 October, 1948–1951; all collected by J. G. Franclemont; 4 in Cornell University, Department of Entomology Collection, 254 in Franclemont Collection. 1 male, Raleigh, North Carolina, in the Cornell University, Department of Entomology Collection. 1 male, Lakehurst, New Jersey, 17 September, Frederick Lemmer; 1 male, Glen Echo, Maryland, June 2; 2 males, Washington, D. C., May 17, 1882; 1 male, Wash-

ington, D. C., May 22, 1882; 1 male, Washington, D. C., 30 May, 1916; 7 females, Lakehurst, New Jersey, 17 September, Frederick Lemmer; 2 females, Washington, D. C., 3 and 12 August 1882; 1 female, Raleigh, North Carolina, 9 August 1905; 1 female, Tryon, North Carolina, May 27, 1904, Fiske Collection; all in the U. S. National Museum Collection.

In addition, the species has been seen from the following localities: Martha's Vineyard and Newton Highlands, Massachusetts; McLean Bogs and North Collins, New York, as well as specimens merely labelled "New York"; Chicago, Illinois; Pennsylvania, Tennessee and Texas.

This species is dedicated to a very gracious lady, Mrs. Frank Morton Jones, of Wilmington, Delaware.

Cuculliinae

Eupsilia sidus (Guenée)

Scopelosoma sidus Guenée, Histoire Naturelle des Insectes, Species Général des Lépidoptères, vol. 5 (Noctuélites 1), p. 386, 1852.

Type locality: "Amérique Septentrionale."

Location of type: Destroyed!

Dichagramma walkerii Grote, Proc. Ent. Soc. Philadelphia, vol. 2, p. 439, pl. 9, fig. 5, 1864.

Type locality: "Canada; Middle States."

Location of type: Lost!

Scopelosoma colorado Smith, Jour. New York Ent. Soc., vol. 11, p. 21, 1903.

Type locality: "Glenwood Springs, Colorado."

Location of type: U. S. National Museum.

The following is a translation of the original French description of *sidus*:

"Extremely similar to *Satellitia,* from which it appears to me however to differ by the following characters:

"The forewings are noticeably broader and shorter, with the teeth more rounded, with the costa more convex, with the inner margin more strongly bent at the base, then almost parallel to the costa; also, with the outer margin less rounded, of a very uniform brick red, with the lines hardly distinct; the reniform spot is like that in variety A ["la tache réniforme d'un jaune-safrané"], but it must also probably be white."

From what we know about the source of Boisduval's material described by Guenée, it seems safe to assume that the type of *sidus*

was collected by Say in New Jersey, given to Leconte and sent by Leconte to Boisduval.

Part of the "exotics" described by Guenée from the Boisduval Collection were destroyed after Guenée returned them to Boisduval and before Charles Oberthur purchased the Boisduval Collection in 1873. In response to an inquiry by William Barnes, the purchaser of all the North American material in the Charles Oberthur Collection, René Oberthur, brother of Charles, explained the absence of many of the types in the Charles Oberthur Collection by disclosing that after the material was returned, it was allowed to remain in poor boxes on top of the cabinets; consequently, it became infested with dermestids. Most of the infested material was thrown away, but some, still in good condition was given to Deyrolle for disposal; Mabille bought this material, and René Oberthur, purchaser of the Mabille Collection, gave the moths to his brother Charles; so it must be assumed that any missing types had been destroyed.

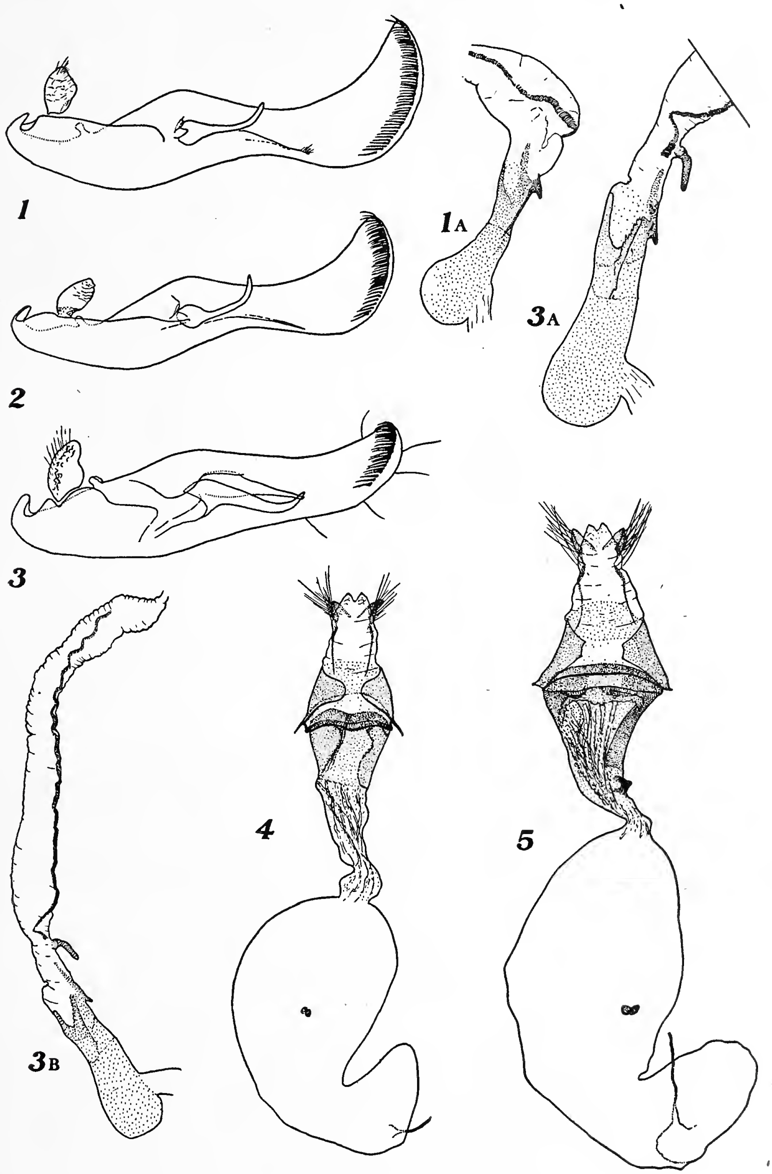
The species I identify with this name is common throughout the eastern United States, and particularly common in New Jersey in the barrens areas. The vestiture of the forewings is soft; the scales are very deeply cleft with the long ends twisted and curled, giving the wing the appearance of excelsior or shredded wheat when viewed under the low power of the microscope. This is a very unique feature in the noctuids, possessed by two other species in this genus. The fringe is only slightly toothed, with the teeth well rounded. The color is warm red-brown, when very fresh, to dull, dusky brick red, very uniform in appearance; the lines are obsolescent, the t. a. slightly waved near costa, the t. p. dark and dentate; the reniform is usually yellow or white, rarely orange.

Male genitalia (figures 19 and 10A) with the cucullus of the valve narrow and the juxta broad at the apex.

Female genitalia (figure 14) with four very conspicuous signa on the bursa; with a prominent pouch at upper left of bursa; and with a strongly chitinized, ridged area near the opening of the ductus bursae into the bursa.

Explanation of Plate VII

1. *Euagrotis lubricans,* male genitalia, right valve. 1A. *E. lubricans,* male genitalia, aedoeagus. 2. *E. illapsa,* male genitalia, right valve. 3. *E. forbesi,* male genitalia, right valve. 3A. *E. forbesi,* male genitalia, aedoeagus. 3B. *E. forbesi,* male genitalia, aedoeagus with vesica fully extended. 4. *E. lubricans,* female genitalia. 5. *E. forbesi,* female genitalia.


1
1A
3A
2
3
3B
4
5

As identified here, *walkeri* Grote is a synonym, and judging from the figure and description it was based on a worn hibernated specimen. Grote's type is also lost, but was probably also from the vicinity of Philadelphia since it was in the collection of the Entomological Society of Philadelphia. Mr. Rehn informed me that the collections of the American Entomological Society, successor of the Entomological Society of Philadelphia, were turned over to the Academy of Natural Sciences in the 1880's; what happened to them in the late 50's and during the 70's is not known, but many of the Grote, and Grote and Robinson types have disappeared.

Colorado Smith may be treated as a race of this species; it is slightly paler, whether this character will hold in fresh material I do not know.

Eupsilia cirripalea n. sp.

The vestiture is similar to that of *sidus,* but the color is browner, and the outer margin of the forewing is strongly toothed. The genitalia of both sexes are very distinctive; the juxta of the male has a blister-like bulge at middle, and bursa of female has only two signa.

Head, thorax and forewings deep russet brown to reddish brown, rather uniform. The vestiture of the forewings soft, composed of deeply forked scales with the long ends twisted and curled; the ordinary lines evident, but not strongly marked; the basal half-line wide, undulate and pale; the t. a. line, wide, almost straight and erect, pale; the t. p. line narrow, dentate and black; the median shade evident, dark, wide, angled out below reniform; s. t. line vague, pale undulating. Orbicular absent; reniform bright fiery orange or white. Hind wings fuscous with a pinkish hue; the fringes pale. Abdomen concolorous with hind wings, with lateral and anal tufts reddish.

Expanse: 35–39 mm.

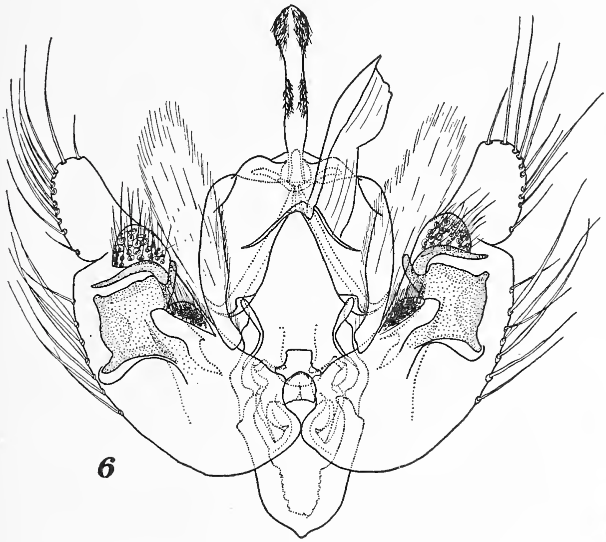
Male genitalia (figures 9 and 9A) similar to *sidus,* but with broader valves, the digitus longer and stouter, the clasper shorter, and with a strong, raised, conical, median process on the juxta.

Female genitalia (figure 12) with two longitudinal signa, and with a small chitinized, ridged area near the junction of the ductus bursae and bursa.

Explanation of Plate VIII

6. *Leucania phragmatidicola,* male genitalia. 6A. *L. phragmatidicola,* male genitalia, aedoeagus. 7. *L. linda,* male genitalia. 7A. *L. linda,* male genitalia, aedoeagus. 8. *Leucania linda,* female genitalia.

BULL. B. E. S. VOL. XLVII PLATE VIII



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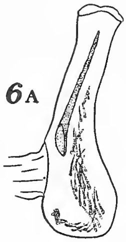
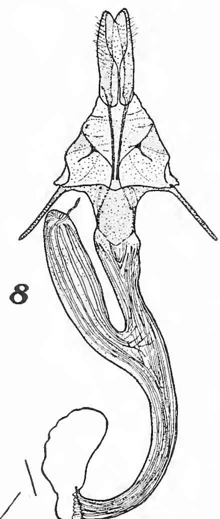


6A



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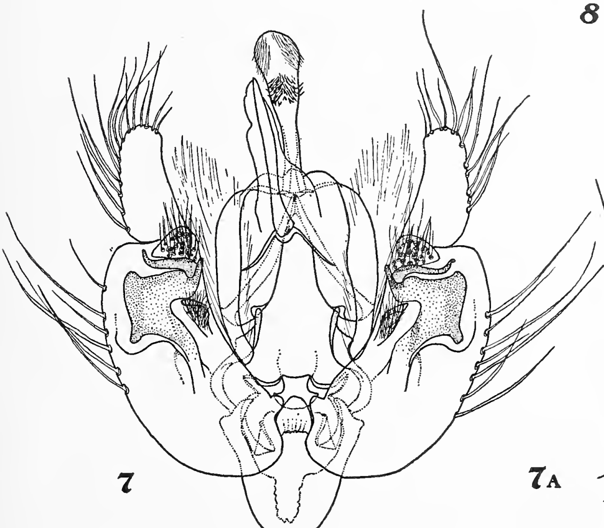

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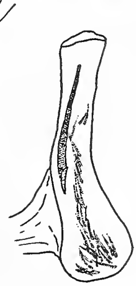


7A

The larva of this species is extremely similar to those of *sidus*, *vinulenta* and *morrisoni*, and there are apparently no satisfactory characters for the separation of the species. *E. tristigmata* differs from the four species mentioned in having the cervical shield uniform, without the transverse, lateral, pale line on each side.

Head dark brown with the occipital area pale yellow, some reticulation on the sides above the ocelli. Cervical shield dark brown with a wide, pale line on each side, this continuing back on the thoraic and abdominal segments as a very faint, narrow, pale subdorsal line on each side. The dorsum of all segments velvety, dark greenish brown, the sides somewhat lighter and with an indication of very vague reticulations; lateral line narrow on the thoracic segments, widening on the abdominal segments, white with a pinkish tint, most intense on last two or three abdominal segments; venter pale yellowish with a strong greenish cast, some pinkish hues below lateral line, most noticeable on thoracic segments. Foodplant: *Prunus serotina* Ehrh.

Type: Male, Arlington, Virginia, 19 October 1949, J. G. Franclemont, in U. S. National Museum Collection (*ex* Franclemont Collection); USNM Type No. 61479.

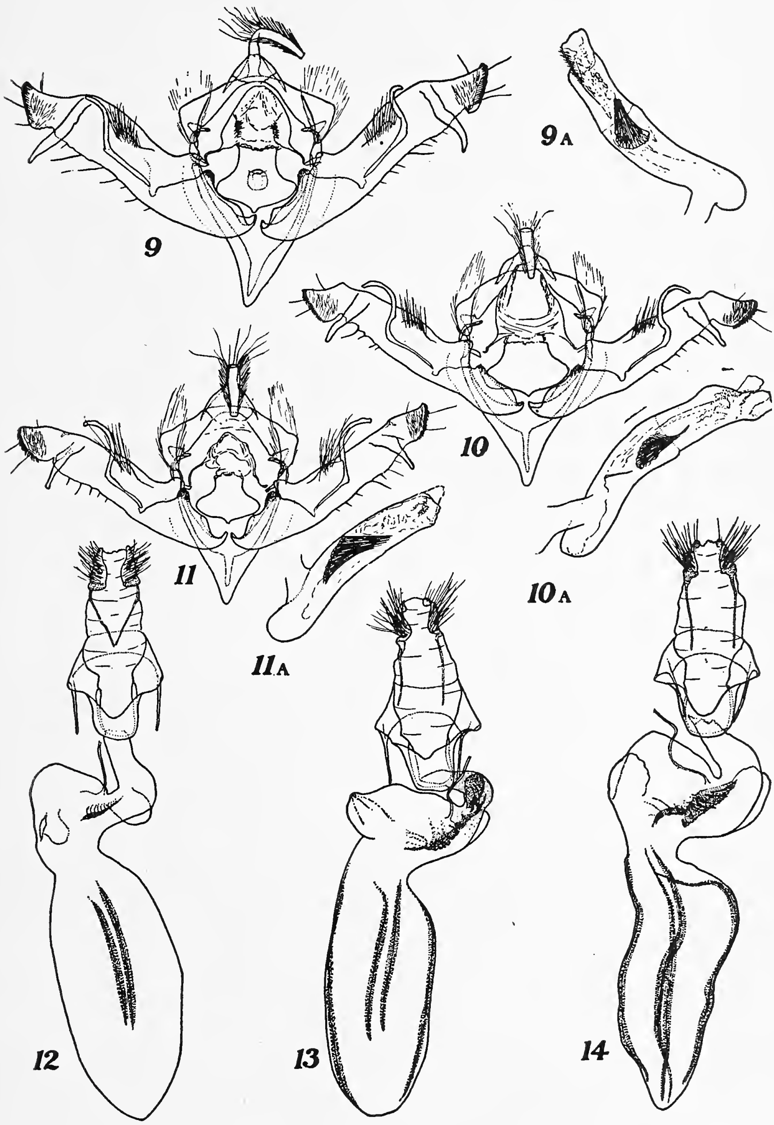
Paratypes: 54 males and 52 females, Arlington, Virginia, 14 October–24 November, 1948–1950; 103 in Franclemont Collection, 3 in Cornell University, Department of Etomology Collection. 12 males and 11 females, Arlington, reared, emergence dates, 31 July–13 September 1949; 22 in Franclemont Collection, 1 in Cornell Collection. 3 males and 10 females, Washington, D. C., reared (No. 3336), emergence dates 7–22 October 1884, A. Koebele; 1 female, Washington, D. C., 12 April 1884, A. Koebele; all in the U. S. National Museum Collection.

In addition this moth has been seen from the following localities: Pittsburgh, Pennsylvania; Quincy, Illinois; and Manitoba, one specimen collected by Health. Additional material is needed from the last locality to verify the reliability of the label on the single specimen. In collecting at "Springhill," Arlington, this has been

---

Explanation of Plate IX

9. *Eupsilia cirripalea*, male genitalia. 9A. *E. cirripalea*, male genitalia, aedoeagus. 10. *E. sidus*, male genitalia. 10A. *E. sidus*, male genitalia, aedoeagus. 11. *E. vinulenta*, male genitalia. 11A. *E. vinulenta*, male genitalia, aedoeagus. 12. *E. cirripalea*, female genitalia. 13. *E. vinulenta*, female genitalia. 14. *E. sidus*, female genitalia.


9
9A
10
10A
11
11A
12
13
14

the commonest of the four "red" species of *Eupsilia,* the others in order being *vinulenta, sidus* and *tristigmata.*

Eupsilia vinulenta (Grote)

Dichagramma vinulenta Grote, Proc. Ent. Soc. Philadelphia, vol. 2, p. 440, pl. 9, fig. 6, 1864.

Type locality: "Texas" (". . . collected by Mr. E. T. Cresson in Western Texas."). [I am inclined to view the citation of this locality with some misgivings and to believe that the moth might have been collected in the vicinity of Philadelphia.]

Location of type: Lost! When described, it was in the collection of the Entomological Society of Philadelphia.

The figure of the moth published with the original description is an excellent representation of the moth I connect with this name.

The vestiture of the forewings smooth, the scales moderately dentate; the fringe less strongly toothed than in *cirripalea.* The general color of the forewing cinnamon red with some lighter tints and conspicuous violet or blackish violet tints; the basal one-third of wing usually strongly tinted with violaceous and contrasting with the outer two-thirds of wing. The lines conspicuous; t. a. line wide, erect, pale, often not contrasting with the basal third of wing of which it forms the outer margin; median shade vague, angled out below reniform; t. p. line fine, black, dentate; s. t. line pale, dentate; reniform spot orange, white or rarely yellowish. This species occurs throughout the eastern half of Canada and the United States; the westernmost records are Iowa and Manitoba.

Male genitalia (figures 11 and 11A) similar to *sidus,* the juxta less massive, the spines on the vesica almost twice as long.

Female genitalia (figure 13) similar to *sidus,* with four longitudinal signa on the bursa, but with an area of heavy chitinization in the middle of the ductus bursae, and with the chitinized, ridged area at the junction of the ductus bursae and bursa not as extensive nor as heavy.

Amphipyrinae

Apamea smythi n. sp.

Similar to *Apamea lignicolora* (Guenée), with which it has been

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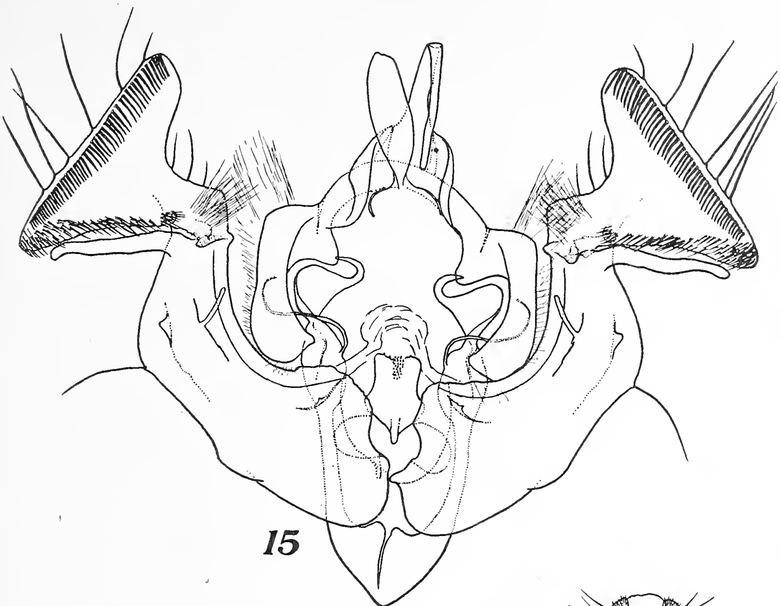
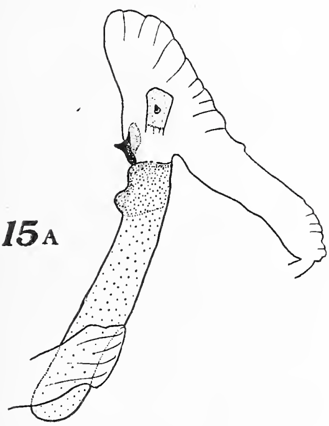
Explanation of Plate X

15. *Apamea smythi,* male genitalia. 15A. *A. smythi,* male genitalia, aedoeagus with vesica fully extended. 16. *A. smythi,* female genitalia.



15



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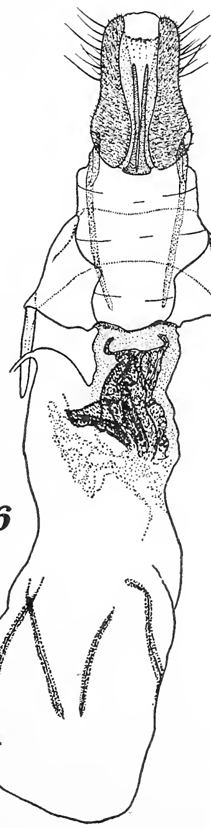

16

confused, but larger, darker brown, and with the s. t. line lacking the two strong teeth on M_3 and Cu_1; the male genitalia similar, but larger and with a more expanded cucullus of the valve; the female genitalia with the ductus bursae shorter and stouter.

Head, thorax and forewings dark brown with a slight purplish cast; all the ordinary markings on the forewings well defined. Basal half-line dentate, black; t. a. line double, inner line darker ground color, the outer blackish, with pale filling between; t. p. line double, the inner blackish, the outer darker ground color, with pale filling between; the s. t. line undulating, with a pale spot at apex beyond it, with dark spots before it in the interspaces between M_1 and M_2, M_2 and M_3, and below Cu_2; the veins lined with the blackish between the t. p. and s. t. lines; fringe dark, interrupted by pale lines at the ends of the veins; orbicular flat, elliptical, its base resting on the t. a. line, well defined by a wide pale annulus surrounded by a narrow blackish brown one; reniform erect, of the usual shape, surrounded by a pale annulus and that by a narrow dark one, most evident on inner side, lower portion filled with dark gray; the claviform a broad loop, strongly outlined by blackish in two specimens and vaguely in the other two. Hind wing dark fuscous brown; the fringe paler. Beneath both wings fuscous with a common t. p. line; the forewing darker on the disk; the hind wing paler on the disk and with a prominent, dark discal spot.

Expanse: 52–53 mm. This is the largest species of *Apamea* (*Septis*) in the eastern states; its only rivals being the western species *maxima* and *acera*.

Male genitalia as figured. (Figures 15 and 15A.)

Female genitalia as figured. (Figure 16.)

Type: Male, Montgomery County, Virginia, E. A. Smyth, in U. S. National Museum Collection (*ex* Smyth Collection); USNM Type No. 61480. [The apex of the right forewing is damaged, otherwise the specimen is in excellent condition.]

Paratypes: 2 females, Montgomery County, Virginia, July 21, 1903, and July 19, 1907, E. A. Smyth, in U. S. National Museum Collection (*ex* Smyth Collection). 1 female, Blacksburg, Virginia, July 23, in Franclemont Collection (*ex* Erb Collection).

The exact locality in Montgomery County where these four specimens were collected is a moot question. I doubt the Blacksburg locality on the specimen in my collection; Blacksburg was Smyth's home. Poverty Hollow was apparently one of Smyth's favorite collecting localities; Hermann J. Erb visited him and col-

lected with him on occasion. There are probably other specimens of this moth in various collections because Smyth did a great amount of exchanging with other collectors. Erb disposed of some of his collection before his death, and it was from him that I purchased the specimen in 1935.

This species is named in honor of the late Professor E. A. Smyth, whose collection was generously given to the U. S. National Museum by his heirs.

Acknowledgement

I wish to express my sincere thanks to D. S. Fletcher, of the British Museum (Natural History), for furnishing me with conclusive evidence as to the identity of Walker's types of *illapsa* and *associans,* and Guenée's types of *lubricans;* without this help, it would have been impossible to be absolutely sure to which of the three species, occuring in eastern North America, the names applied.

BOOK NOTES

Fleas, Flukes & Cuckoos, by Miriam Rothschild and Theresa Clay. xiv + 304 pp., 99 black and white photographs, 4 maps and 22 drawings. 6 × 9 ins., cloth bound. 1952. The Philosophical Library, Inc., New York, N. Y. (Price, $8.75).

This interesting volume is devoted to a study of the parasites of birds, a subject which has not been treated in an independent way in the past although brief references to some of the fascinating aspects of avian parasitology are standard inclusions in biology texts.

Part One of the book considers such fundamental aspects as parasitism, commensalism, symbiosis, effects of parasitism both on the host and the parasite and the origins of parasitism. Part Two is devoted to fleas and feather lice while Part Three is a rapid survey of the main groups of bird parasites found in Britain.

The material is presented in a exceedingly fine fashion and is accompanied by excellent illustrations. The printing and the binding are of high quality.—George S. Tulloch, Merrick, N. Y.

ADDITIONS TO VESPINE BIOLOGY X: FORAGING AND CHEMOTAXIS.

By Albro T. Gaul, Brooklyn, N. Y.

It is the purpose of this paper to present certain observations and experimental results on the habits and method of food finding by the Vespine wasps. Although much of the material is drawn from field records on a number of common species in the Northeastern States, the experimental work was all tried with *Vespula maculifrons* Buy. This author has already shown that the selection of food, and the determination of its wholesomeness is an adult worker function[1]. Since the greater number of hornet-hours of labor are reserved by the colony for the purpose of foraging for food, it was thought worthwhile to record this information.

It has been pointed out that there is a regular squad of workers whose job it is to provide for the alimentary needs of the colony.[2] These workers must first find suitable foodstuffs, then they must work them into a size and condition for transport and finally, they must carry them back to the nest where the nutritious material is turned over to brood nurses. Field observations by this author and others show that the Vespine wasps frequent nectar bearing blossoms and carrion beside their capture of living caterpillars, flies etc. as prey. The literature on these habits is abundant, and it is not the purpose of this paper to refer to them here.

Experiments were performed to determine the worker's method of locating foods. Two tables were placed eight feet each side of an established flightway of *V. maculifrons,* in such a way that one was to the windward and the other to the leeward of the flightway. These tables were a little more than twenty feet from the nest entrance, or at the approximate limit of the range of orientation flights. Baits, comprising petri dishes covered with honey, were placed on the tables.

It was noted almost at once, that foraging workers would make for the windward bait, while they ignored the leeward baits. Many of the wasps left the common flightway and flew with the wind (i. e. away from the windward bait) for a few feet before locating the source of the honey odor upwind. They then turned 180° and made directly for the honey laden petri dishes. Some wasps turned immediately upwind to the honey without the hesitant pattern of their fellows. At the end of the first ten minutes of this experiment, the upwind honey bait had attracted 32 visiting ergates, while the leeward bait had none.

This experiment was repeated at different times on different days (not necessarily consecutive days), with the tables in the same place, and with substantially the same results. Since honey has a distinctive odor (to man at least) and since glucose solutions seem odorless, a control experiment was tried by substituting glucose solution for the honey baits. Wasps did not visit the glucose. This shows that (A) there had been no formation of a visiting habit and (B) the odorless material was not attractive. Within a full hour only four wasps had sampled the glucose, apparently by chance, since two of the visitors were of a species from another colony. It is thus concluded that the chemotaxis of olfaction is at least partly responsible for the success of the wasps in locating their food. It would certainly assist in the location of nectar bearing flowers and carrion; and it might serve to some extent in locating living prey.

My own observations on the habits of *Dolichovespula maculata* Linn. would seem to point to the likelihood of attraction to prey by sight. The pouncing and surreptitious advances made by these workers upon unsuspecting flies could only be the result of visual responses. As further evidence, the flies are so active that their odor trails in the wind would be meaningless and difficult or impossible to follow.

Are these chemotactic and visual responses active and functioning at all times? The answer to this problem was demonstrated by the workers of *maculifrons* in the nest under test. This author has previously shown that a wasp ordinarily engaged in one nest activity will not readily turn to another activity unless there is a social demand for the change.[2] That this is true, even at the expense of efficiency, is again demonstrable here. It has been noted that the sanitation workers (loc. cit.) fly from the nest with their dead, making a great sweeping flight, roughly circular in path, dropping their cargos at or beyond the midway point, and return to the nest. The return path of most of the sanitation workers of this *maculifrons* nest coincided with the regular flightway. Thus the now emptyhanded sanitation workers were flying homeward through the stratum of air that was redolent of the honey baits. Passage through this zone does not effect any response by these workers. In the interests of labor efficiency, these ergates could easily stop to acquire a load of honey. That they do not can only indicate that the wasp's nervous mechanisms do not permit the stimulus for one activity to divert them from another activity in which they are engaged.

It has thus been indicated that wasps engaged in food foraging

use their sense of olfaction and sight in locating the source of nourishment. It is further indicated that wasps, engaged in one activity, will not become diverted to another activity by the mere presence of stimuli associated with the second activity.

References

(1) **Gaul, A. T.** 1941. Experiments of the Taste Sensitivity of *Dolichovespula arenaria* Fab. Jour. N. Y. Ent. Soc., XLIX, pp. 367–369.

(2) ——————. 1948. Distribution of Labor in the Colonies of Hornets and Yellowjackets. Bull. Brook. Ent. Soc., XLIII, pp. 73–79.

Schinia saturata Grote.—Roy Latham, Orient, Long Island, N. Y., reports a male specimen of *saturata* taken by his brother at lights at Riverhead, L. I., September, 1928. Type localities are "Texas" and "Mass." A gulf species, it is regularly taken as far north as Southern Pines, N. C. Mr. Latham's Riverhead specimen supplies a notable northern record that may be unique for Long Island.—R. R. McElvare, Port Washington, N. Y.

BOOK NOTES.

Green Treasury, *A Journey Through the World's Great Nature Writing,* selected and edited by Edwin Way Teale. xxi + 615 pp., 6 x 9 ins., cloth bound. 1952. Dodd, Mead & Company, New York, N. Y. (Price, $5.00.)

Here in one volume the literary gems of the world's great nature writings are brought into the view of all. Well over 50,000 pages were reviewed by the author in his search for the material which is included in the **Green Treasury.** The 181 selections by 87 authors are grouped under such headings as water, land, sky, seasons, plants, animals, insects, reptiles and birds. Preceding each selection there are interpretive comments written in Teale's inimitable style which serve to personalize the works of the various authors.

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CONTENTS

(Arranged alphabetically throughout)

Diptera

General Subject

Heteroptera

HOMOPTERA

HYMENOPTERA

LEPIDOPTERA

OTHER ORDERS AND OTHER ANIMALS

INDEX TO VOLUME XLVII

Arranged alphabetically throughout; valid species in Roman type, new species and other forms in **boldface.** ∅ indicates other animals; * plants.

Number of New Genera in this Index—5.
Number of New Species in this Index—55.

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WANTED—Proc. Ent. Soc. Phila., vols. 1–6; Proc. Calif. Acad. (Nat.) Sci., vols. 1–7; Psyche, vols. 11, 13, 15; Trans. Amer. Ent. Soc., vols. 1–5; Bull. Buff. Soc. Nat. Sci., vols. 2–3; Proc. Acad. Nat. Sci. Phila., vols. 1–8. C. F. dos Passos, Mendham, New Jersey.

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CONTENTS

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BULLETIN

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BROOKLYN ENTOMOLOGICAL SOCIETY

Vol. XLVIII FEBRUARY, 1953 No. 1

TEN NEW SPECIES OF MEXICAN *DIKRELLA* (HOMOPTERA—CICADELLIDAE).

By Robert F. Ruppel and Dwight M. DeLong, Columbus, Ohio.

A recent publication by the authors[1] presented the descriptions and illustrations of the specific and differential genital characters of eleven new species of *Dikrella*. Ten more species belonging to the same genus are described in the following pages. The types of all species are in the DeLong collection.

Dikrella crocea n. sp.

Resembling *rubralineata* Rup. and DeL. in general form and appearance, but with distinctive coloration and genitalia. Length 2.0 mm.

Color: The vertex is cream with a pair of broad, longitudinal median orange stripes which widen laterally near each eye. The face is pale tan with a median and paired lateral, elongate orange bars on its dorsal portion between the eyes. The pronotum is light cream with a pair of large, orange marks on the center of its disc. The scutellum is pale cream. The elytra are semi-hyaline marked with red and orange spots. Three large orange spots appear on each clavus and one or two small red spots are located near the apex of each clavus. Two large orange spots are present on the corium near the claval suture and small red and orange spots are located on the corium and apical cells.

Genitalia: Female seventh sternite with the posterior margin conically produced, its basal angles rounded, and its medium fourth is produced into a blunt lobe. The male pygofers are short with their apices pointed. The plates are rather long, slender, and blunt

[1] Some New Species of Mexican *Dikrella*—Ohio Jour. Sci. 52: 89–95, 1952.

at their apices. The styles are short, broad, and their mesal-apical lobes are long and pointed. The connective is T-shaped and slender. The aedeagus is composed of a short, thick base and a long, thin phalicata which appears bifurcate apically in ventral view.

Holotype male, allotype female, male and female paratypes collected in Mexico (M.B. 300) by Dampf.

Dikrella exila n. sp.

Resembling *angustella* Rup. and DeL. in general form and appearance but with distinctive male genitalia. Length 3.1 mm.

Color: The vertex, face, pronotum, and scutellum are a uniform, pale ivory-cream. The elytra are hyaline with the areas near the transverse veins slightly infuscated.

Genitalia: The pygofers are long, narrow, and rounded at their apices and lack hooks. The plates are long, their lateral margins are each produced into a rounded lobe near their bases, and their apices are rounded. The styles are long with their lateral- and mesal-apical lobes sharp at their apices. The connective is a broad, flat, triangular plate. The base of the aedeagus is a narrow shaft which bears the curved, parallel-sided phalicata at its apex. Two pairs of processes arise near the middle of the shaft at the base. There is a pair of long, thick, ventro-lateral processes which extend above the apex of the phalicata and a shorter, more lateral pair which is about one-fourth the length of the first pair.

Holotype male collected at Chilpancingo, G'ro., Oct. 25, 1941 by DeLong and Good.

Dikrella opala n. sp.

Resembling *bimaculata* Rup. and DeL. in general form and appearance but with distinctive male genitalia. Length 2.7 mm.

Color: The vertex, face, pronotum, and scutellum are a uniform pale ivory. The elytra are hyaline with a large, round, black spot in the anterior apical cell and a less distinct, black spot in the posterior apical cell.

Genitalia: The pygofers are short, bluntly angled at their apices, and bear slender, sharply-pointed hooks on their dorso-caudal angles. The plates are broadly expanded at their bases, narrowed distally, and are widely separated at their bases. The styles are short, their lateral-apical lobes are wanting, and their mesal-apical lobes are long and pointed. The connective is a broad, triangular plate. The base of the aedeagus is short with its dorsal processes extended into long, thin, straight rods. The phalicata is very short

and bears a pair of short, lateral processes which are expanded sharply at their apices. A pair of long, thin, ventro-lateral processes arise on the base and extend caudad beyond the apices of the plates.

Holotype male collected at Yatao, Oax., Nov. 15, 1935 (M.F. 6241A) by Dr. Dampf.

Dikrella dentata n. sp.

Resembling *bimaculata* Rup. and DeL. in general form and appearance, but with distinctive male genitalia. Length 2.7 mm.

Color: The vertex, pronotum, and scutellum are ivory. The face is dull tan. The elytra are hyaline with a distinct, round, black spot in the anterior and posterior apical cells.

Genitalia: The pygofers are long and nearly truncate apically. The slender, pointed pygofer hooks arise on the dorso-caudal angles of the pygofers; each extends ventrad on its proximal half and then is bent sharply caudad. The plates are long and rather narrow broadly separated at their bases, and each bears a prominent tooth on the basal third of the lateral margin. The styles are rather short and narrow with their mesal-apical lobes long, thin, and strongly curved and with their lateral-apical lobes short and blunt. The connective is T-shaped and slender. The base of the aedeagus is long and cylindrical. The dorsal processes of the aedeagus are nearly as long as the short, parallel-sided phalicata. A pair of long, slender, ventro-lateral processes arise on the base of the aedeagus and curve caudo-dorsad, extending beyond the apices of the pygofers.

Holotype male collected on the Acapulco Rd., Mexico, Nov. 22, 1938 by Dr. J. S. Caldwell.

Dikrella lurida n. sp.

Resembling *aureocosta* Rup. and DeL. in general form, but more golden in color and with distinctive genitalia. Length 2.5 mm.

Color: The vertex is cream with a pair of irregular, golden-yellow spots on its disc. The face is golden-yellow with its dorsal portion ivory. The pronotum is golden-yellow with the anterior margin cream. The scutellum is cream. The elytra are light yellow with the veins golden.

Genitalia: The pygofers are short, rounded at their apices, and bear long, slender, strongly recurved hooks on their dorso-caudal angles. The plates are long and slender. The styles are short with their mesal- and lateral-apical lobes long and pointed. The con-

nective is nearly V-shaped. The base of the aedeagus is rather thick and bears a pair of broad, sharply pointed, slightly recurved, ventro-lateral processes. The phalicata is slightly recurved and about two-thirds the length of the ventro-lateral processes.

Holotype male collected at Iguala, G'ro., Oct. 25, 1941 by DeLong and Good.

Dikrella duplica n. sp.

Resembling *rubralineata* Rup. and DeL. in general form and appearance, but with distinctive coloration and genitalia. Length 2.5 mm.

Color: The pronotum and vertex are cream, marked by a pair of parallel, longitudinal orange vittae which extend from the apex of the vertex to the posterior margin of the pronotum. An orange spot is located on the anterior margin of the pronotum proximal to the outer angle of each eye. The face is dull cream becoming ivory on its dorsal portion. The scutellum is cream with its apex red and its basal angles light orange. The elytra are hyaline marked with red and orange spots. Three orange spots are located on each clavus and one orange spot is present on each corium near the middle of the claval suture. The red spots are scattered on the corium and are larger and fewer in number than those of *rubralineata.*

Genitalia: The pygofers are rather broad and truncate at their apices. An oblique, thickened fold extends across each pygofer from its base to its apex. The plates are long and blunt apically. The styles are short, with their mesal- and lateral-apical lobes pointed. The connective is V-shaped. The base of the aedeagus is long and cylindrical with its dorsal processes prominent. A pair of slender, ventro-lateral processes arise on the base of the aedeagus and extend parallel to the slender, curved phalicata to near its apex.

Holotype male and male paratype collected at Iguala, G'ro., Sept. 11, 1939 by D. M. DeLong; paratype males at Iguala, G'ro., Nov. 25, 1941 by DeLong and Good; male paratype at Vejuco, G'ro., Sept. 3, 1930 (M.F. 1790) by J. Parra.

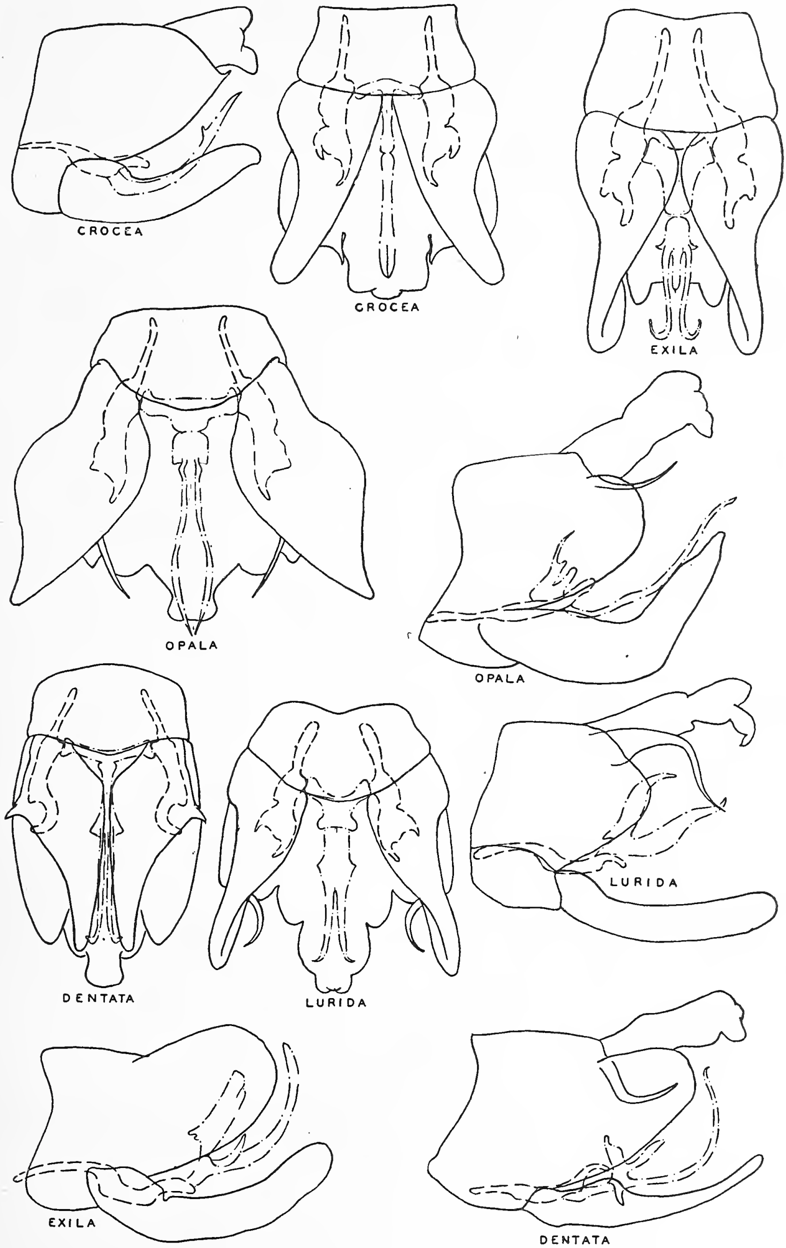
Dikrella scinda n. sp.

Resembling *angustella* Rup. and DeL. in general form and appearance, but with distinctive male genitalia. Length 2.5 mm.

Explanation of Plate I

Lateral and ventral views of genital capsules of males as named showing position of styles, aedeagi, and pygofer hooks.

BULL. B. E. S. VOL. XLVIII PLATE I



Color: The vertex, face, scutellum, and pronotum are nearly uniformly ivory-white. The elytra are hyaline with an interrupted smoky band crossing them at the region of the transverse veins.

Genitalia: The pygofers are elongate, slender, and rounded at their apices. The plates are rather long, rounded at their apices, and deeply, roundedly notched on the basal third of their lateral margins. The styles are short with their mesal-apical lobes very long and slender. The connective is a flat, triangular plate. The aedeagus is composed of a triangular base, elongate, dorsal processes, and a long, thin, sharply-pointed phalicata.

Holotype male collected at Finca Prusia, Chiapus, Dec. 4, 1932 (M.F. 2843) by Dr. Dampf.

Dikrella unica n. sp.

Resembling *rubralineata* Rup. and DeL. in general form and appearance, but differing in coloration and male genitalia. Length 2.5 mm.

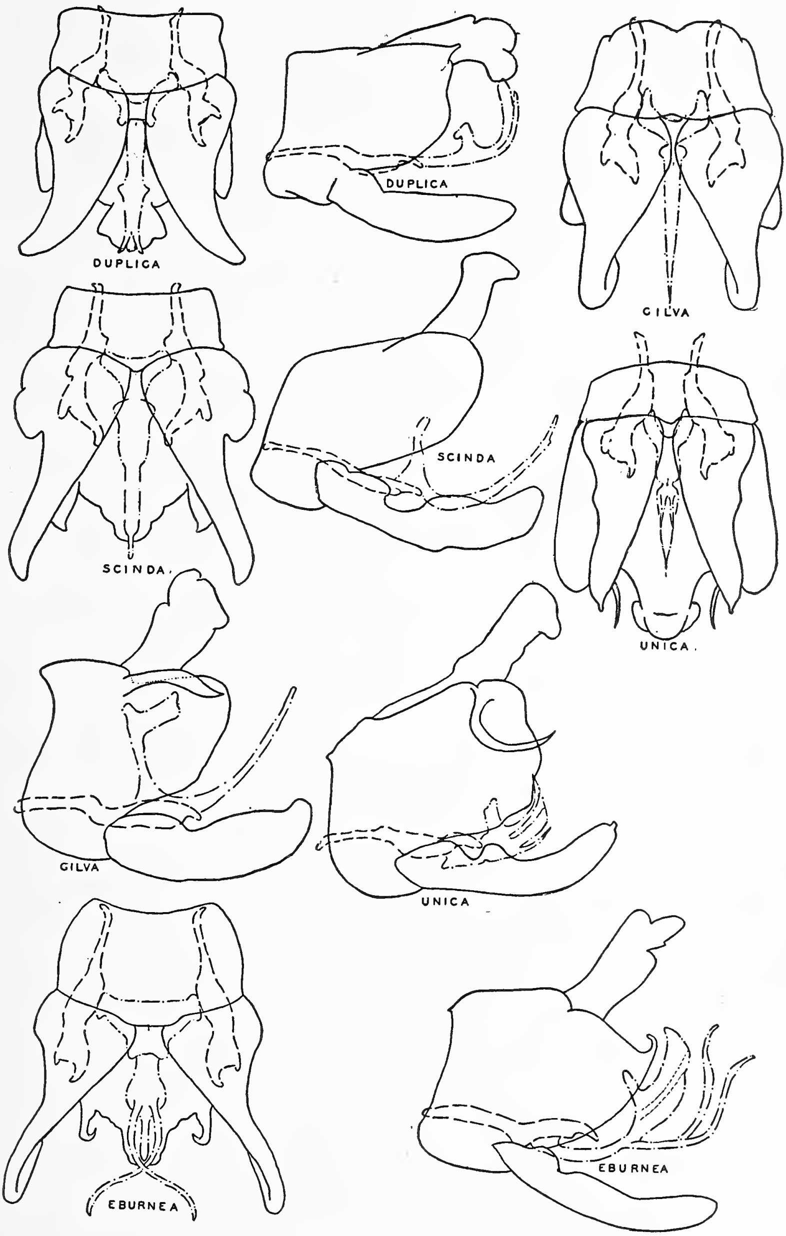
Color: The vertex is ivory marked with two pairs of scarlet lines near its apex and a pair of orange-red lines on its disc. The apical lines consist of a pair of short, median, oblique lines and a pair of longer, more lateral lines which parallel the margin. The discal lines of the vertex are transverse and extend from the middle of the vertex to near each eye. The face is dull brown with its genae dull gray, and with its dorsal portion ivory. A pair of irregular, transverse, scarlet stripes extend between the eyes on the ivory-colored portion of the face. The pronotum is ivory with scattered, small red spots on its disk, and with a pair of indistinct orange areas on the central portion of its disk. The scutellum is ivory with its apex and basal angles orange. The elytra are semi-hyaline with round, scarlet spots scattered over their surfaces, and with two large, orange spots which are bordered by small, red spots on each clavus and corium.

Genitalia: The pygofers are broad, nearly truncate apically, and bear long, strongly-curved hooks on their dorso-caudal angles. The plates are rather short and bear a rounded lobe on the proximal third of the lateral margins and a short, thick spine at their apices. The styles are short with their mesal-apical lobes long.

Explanation of Plate II

Lateral and ventral views of genital capsules of males as named showing position of styles, aedeagi, and pygofer hooks.

BULL. B. E. S. VOL. XLVIII PLATE II



The connective is Y-shaped. The base of the aedeagus is short, its dorsal processes are rather thick, and it bears a pair of slender, ventro-lateral processes which extends parallel to the thick, short, truncate phalicata.

Holotype male collected at Chilpancingo, G'ro., Oct. 25, 1941 by DeLong and Good.

Dikrella gilva n. sp.

Resembling *aureocosta* Rup. and DeL. in general form and appearance but with distinctive coloration and genitalia. Length 2.5 mm.

Color: Almost uniformly cream. The anterior margin of the pronotum is ivory and the posterior transverse veins and the apices of the longitudinal veins anterior to the transverse veins are fuscous. In addition to these marks, the Chilpancingo specimens have a pair of elongate, longitudinal, orange marks on each clavus.

Genitalia: The pygofers are broad, rounded at their apices, and bear broad, slightly recurved hooks at their dorso-caudal angles. The plates are broad and rounded at their apices. The styles are rather long with their mesal-apical lobes broad. The connective is V-shaped and broad. The base of the aedeagus is long, cylindrical, and bears a long, slender, ventral process which extends to near the apices of the pygofers. The phalicata is broad, parallel-sided, and truncate apically.

Holotype male collected at Valles, S.L.P., Sept. 24, 1941; male paratypes from Tamazunchale, S.L.P., Sept. 25, 1941; and Chilpancingo, G'ro., Oct. 25, 1941 by DeLong, Good and Caldwell. Male paratypes, San Geronimo, G'ro., Aug. 30, 1930 (M.F. 1787) by J. Parra; and Iguala, G'ro., Sept. 11, 1939 by DeLong.

Dikrella eburnea n. sp.

Resembling *rubropuncta* Rup. and DeL. in general form and appearance, but with distinctive coloration and genitalia. Length 2.3 mm.

Color: The vertex is ivory with a narrow, transverse, orange band extending between the eyes. The face is ivory. The pronotum is ivory with a pair of large, orange spots on the center of its disc. A small, red spot is located on the side of the body near each lateral angle of the pronotum. The scutellum is ivory with a small, red spot at its apex. The elytra are ivory, semi-hyaline with two orange spots on each clavus, the posterior spot large and the anterior spot is rather small. Three orange spots are located

on the corium near the claval suture, an anterior, small pair and a large posterior spot. A pair of small, red spots are located near the costal margin of each elytron. The transverse veins are infuscated.

Genitalia: The pygofers are broad with their apices turned up into short, thin, curved processes. The plates are long and rather slender. The styles are broad with their mesal- and lateral-apical lobes long and blunt. The connective is a broad, triangular plate. The base of the aedeagus is long and cylindrical and bears a pair of long, thin, ventro-lateral processes which cross each other near their bases. The phalicata is broad, parallel-sided, and truncate apically.

Holotype male collected at Pandancuarco, G'ro., Aug. 28, 1930 (M.F. 1785) by Dr. Dampf.

Shuttle Service with Honey-Sample Shipping Tubes: Honey-sample shipping cases (mailing tubes) have proved to be useful for sending insect specimens in glass vials through the mail. These mailing cases were obtained from beekeeper supply houses. For aphid, Collembola and mite samples, one dram homeopathic vails have been used for a number of years by the worker from Utah.

When a study of Utah Collembola was undertaken in 1948, the shipments of preserved material were made in honey-sample mailing tubes having an inside measurement of 2½ to 2¾ inches high, by 2 inches inside diameter. Cotton was placed in the bottom and top; enough also was placed between the vials to keep them from rattling. Each mailing tube contained 8 of the one-dram vials when shipped. During the course of this study 400 such mailing tube shipments have been made. These sendings transported a total of approximately 3,200 one-dram homeopathic vials of insect material. During the process, fewer than 50 of the vials were broken. Rarely was more than one vial broken in a shipment; in many cases recovery of most of the specimens was possible. The mailing tubes have been returned regularly from North Carolina to Utah, each containing seven empty vials. In only four instances were returned vials broken. In one case the mailing tube had been crushed and 4 of the vials were broken. This would be a total breakage of not more than 60 vials out of the nearly 6,000 which were transported through the mails in this manner.—G. F. Knowlton, Logan, Utah and D. L. Wray, Raleigh, North Carolina.

MALES OF THE GENUS HYLEMYA *SENS. LAT.* FROM NORTH AMERICA, HAVING DORSAL BRISTLES ON MID METATARSUS, WITH DESCRIPTIONS OF NEW SPECIES, (MUSCIDAE, DIPTERA).

By H. C. Huckett, Riverhead, N. Y.

(Continued from the December issue)

Hylemya (*Delia*) **setiseriata** n. sp.

Male; blackish, parafacials with whitish or silvery pruinescence, antennae black and palpi brownish, proboscis lightly dusted, subshining. Presutural region of mesonotum grayish and when viewed from behind with three well marked vittae, which become less pronounced on the darker blackish postsutural region, scutellum blackish. Abdomen grayish pruinescent with blackish anterior tergal incisures and well defined dorsocentral series of subtriangular marks, hypopygium subshining. Legs black. Wings densely brownish basad; calyptrae whitish, knobs of halteres dull yellow and stalks purplish.

Eyes separated at narrowest width of frons by a distance about equal to diameter of anterior ocellus; parafrontals contiguous caudad, with 3 to 5 pairs of slender bristles on cephalic half; width of parafacials at base of antennae about three fourths breadth of third antennal segment, width of cheeks about equal to that of parafacials at base of antennae, and well maintained caudad. Arista minutely pubescent, and thickened basad. Mesonotum with a well developed middle pair of presutural acrostical bristles, and with one or two weaker presutural pairs, prealar bristle shorter than posterior notopleural bristle, sternopleurals arranged 1 : 2. Abdomen depressed, sides subparallel, tapering caudad, processes subparallel (not divergent), widely spaced apart at base, inner half bare except for 3 or 4 blunt black preapical spinules on inner margin and one or two robust bristles at apical margin, bristles confined to outer (dorsal) border. Fore tibia with 1 mid and a bluntish apical posteroventral bristle; mid femur with weakish bristles on proximal half of anteroventral surface, becoming much shorter and setulose on distal half, posteroventral surface with an evenly spaced series of 6 to 8 erect bristles on proximal three fifths, mid tibia with 1 anterodorsal, 1 posterodorsal, 2 posteroventral bristles, all short; hind femur with antero- and posteroventral series of bristles extending from apex to proximal half, bristles becoming weaker and

shorter proximad, the preapical posteroventral bristles longer than height of femur, hind tibia with 5 or 6 anteroventral and anterodorsal bristles, 3 posterodorsal, posteroventral surface with an extensive series of weaker bristles, becoming longer and series replicated proximad. Mid metatarsus with a dorsal series of longish setae. Wings with *m–cu* cross vein erect.

Female brownish, markings more obscure on mesonotum and less pronounced on abdomen; caudal pair of ocellar bristles slender and directed outward, lower bristle of caudal pair of sternopleurals weak, mid femur weakly bristled on posteroventral surface, mid tibia in allotype with a mid anteroventral bristle, robust anterodorsal and weak posteroventral bristles, hind femur bare on posteroventral surface, hind tibia with 3 or 4 anteroventral and anterodorsal bristles. Otherwise similar to male except for sexual characters.

Holotype and allotype: ♂, ♀, Ilwaco, Washington, V.5.18 (A. Spuler. [U.S.N.M.] Paratypes: ♂, Ilwaco, Washington, IV.2.18 (A. Spuler). ♂, Loon Lake, Washington, V.16.24. (A. L. Melander). ♂, Ogden, Utah, VI.14.37 (D. E. Hardy).

The holotype and allotype of *setiseriata* are I consider slightly teneral, having frons, parafacials and cheeks reddish, thereby differing from the darker color of mature specimens. The species has the habitus of *H. inconspicua* Huckett and *pilifemur* Ringdahl, males of which lack the dorsal series of bristles on mid metatarsus.

Hylemya (*Delia*) **simulata** n. sp.

Male closely resembling *cilicrura* Rond., differing essentially in the structure of the genitalia and copulatory appendages, and by the absence of a short apical bristle on inner margin of processes of fifth abdominal sternum (figs. 1–3). Mid tibia with mid posterodorsal bristle lacking. Mid metatarsus with a well developed series of dorsal bristles, hind tibia with a partial restricted series of weak posteroventral bristles. Length, 4.5 mm.

Holotype: ♂, West Yellowstone, Montana, VIII.3.50 (Dreisbach & Schwab). [U.S.N.M.] Paratypes: 2 ♂, 11 miles North of W. Springs, Idaho, VIII.3.50 (Dreisbach & Schwab). ♂, Edmonton, Alberta, VI.2.36 (E. H. Strickland. [C.N.C.] ♂, Cloudcroft, New Mexico, VI.27.40 (R. H. Beamer). [Univ. Kans.]

The above specimens closely resemble those of *Hylemya segmentata* (van der Wulp), the types of which I was able to examine at the British Museum (Natural History) a few years ago through the courtesy of Dr. van Emden, but without the specimens before me and despite my notes I am unable to draw more definite com-

parisons. The male of *simulata* has all the superficial appearance of a hybrid of *cilicrura* and *liturata,* possessing the hind femoral character of the former and the mid metatarsal bristling of the latter. As in certain male specimens of *liturata* the mid tibia in all the above specimens lacks a mid posterodorsal bristle, and as in examples of *cilicrura* the hind femur may possess a few spurious posteroventral bristles and hind tibia only a partial series. However all specimens of *cilicrura* that I have seen with a restricted series of posteroventral bristles on hind tibia lacked the dorsal series of mid metatarsal bristles. I have concluded that *simulata* merits specific recognition on grounds of differences in structure of male copulatory appendages. In the study of this species I wish to acknowledge the generous and ever helpful advice of Mr. J. E. Collin, who kindly undertook a critical examination of several specimens of doubtful identity.

Hylemya (*Delia*) **vesicata** n. sp.

Male; grayish black, antennae and palpi black, proboscis lightly pruinescent, mesonotum subshining and with trace of three vittae, abdomen cinereous gray pruinescent with uniformly narrow dorsocentral vitta. Legs slate black, pulvilli tinged; wings tinged, denser basad, calyptrae yellowish, halteres yellow.

Eyes separated at narrowest width of frons by a distance equal to width of third antennal segment, interfrontalia uninterrupted caudad, a pair of parafrontal setulae adjacent anterior ocellus, parafacials and cheeks broad, fully as wide and high repsectively as length of third antennal segment, the latter slightly longer than second segment, aristal hairs about as long as basal diameter of arista. Mesonotum and scutellum setulose, with three irregularly paired presutural acrostical bristles in two closely adjacent series, prealar bristle long, basal pair of scutellar bristles and dorsal bristle of mesopleural series longish, sternopleurals arranged 1 : 2. Abdomen cylindricoconical, slightly depressed basad, hypopygium appressed within fifth segment, cerci partitioned and appearing as two roundish knobs, from each of which arises a fascicle of slender black setae, the tips of which extend to base of abdomen. Fore tibia with 1 or 2 median slender and a stout apical bristle on posteroventral surface; mid tibia with 3 to 5 posteroventral, 2 bristles on proximal half and 2 at apex of posterodorsal surface, all as long as posteroventral bristles of mid femur, mid anterodorsal bristle absent; hind femur with anteroventral series of bristles extending to prebasal region, the bristles becoming shorter on proximal half, posteroventral surface with or without fine short bristles on distal

half, hind tibia with 8 to 10 anteroventral, 7 to 9 anterodorsal, 4 or 5 posterodorsal bristles, and a contiuous series of posteroventral setulae from prebasal to preapical region. Second fore tarsal segment swollen on anterior surface, fifth fore tarsal segment with three stiff apical bristles; mid metatarsus more or less setose on dorsal surface, mid tarsal segments 2, 3 and 4 broadened and with long apical thorns on posterior surface. Cross vein *m–cu* oblique and sinuate. Length 9 mm.

Female paler than male, more densely grayish pruinescent, abdominal dorsocentral marks ill defined or suppressed; eyes at narrowest width of frons more widely separated than distance between first pair of dorsocentral bristles, cruciate bristles well developed, interfrontalia with several accessory setulae; two pairs of presutural acrostical bristles. Fore tibia with 2 anterodorsal, with or without mid posterior bristle; mid tibia with or without a weak mid anteroventral bristle, with 2 strong anterodorsal, remaining bristles shorter than in male; hind femur with a series of weak setulose bristles on distal half of posteroventral surface, hind tibia with 4 to 6 anteroventral, 6 or 7 anterodorsal, 3 or 4 posterodorsal bristles; fore and mid tarsal segments normal. Otherwise similar to male except for sexual characters. Length 10 mm.

Holotype and allotype: ♂, ♀, Dana Meadows, Tuolumne County, California, VII.17.49 (L. L. Jensen). [Univ. Calif.] Paratypes: ♂, Tuolumne Meadows, California, VII.1.40 (R. H. Beamer), ♂, North Powder, Oregon, VII.13.31 (J. Nottingham). [Univ. Kans.] ♀, Minam Lake, Wallowa Mountains, 7,700 ft. alt., Oregon, VII.24.49 (C. L. Cooper).

The male of *vesicata* may be readily distinguished from its congeners by the swollen anterior surface of segment 2 and the stiff apical bristles on segment 5 of fore tarsus. In addition the male possesses twin fascicles of very long spreading setae arising from cerci and unusually long bristles on mid tibia. The mid metatarsus in the above male specimens is marked by a coarse series of longish setulae, which although prominent has not the bristlelike serial character typical of *liturata*.

Hylemya (*Delia*) *alaba* (Walker)

Anthomyia alaba Walker, List Dipt. Brit. Mus., IV: 948, 1849.

Hylemyia innocua Malloch, Trans. Amer. Ent. Soc., XLVI: 186, 1920.

The male of *alaba* may be readily distinguished from its allies by the unusually long slender bristles spreading out from margin of

cerci.[5] Six of twelve male specimens before me lack the mid metatarsal bristling. In the remaining specimens the bristling is vestigial or rudimentary, as is apparent in the type at the British Museum (Natural History).[6]

I have seen specimens of *alaba* from Alaska, Alberta, British Columbia, Massachusetts, Michigan, New Hampshire, New Mexico, New York, Nova Scotia, Ontario, Quebec, Vermont, Washington, Wisconsin, Wyoming.

Hylemya (*Delia*) *armata* (Stein)

Chortophila armata Stein, Arch. f. Naturgesch., (1918) LXXXIV A (9): 87, 1920.

The male of *armata* has a black unmarked mesonotum and deep brownish abdomen with decided lustrous reflections, a polished proboscis, and wings that in mature specimens are brownish tinged, densely so basad. The type of *armata,* taken on Mount Constitution, Washington, is devoid of bristles on posteroventral surface of hind femur, whilst in males recorded from Rowdy Creek, Smith River, California, there are a few irregular weak bristles on distal half.

I have seen specimens of *armata* from Alaska, Alberta, British Columbia, California, Colorado, Washington (type).

Hylemya (*Delia*) *attenuata* Malloch

Hylemyia attenuata Malloch, Trans. Amer. Ent. Soc., XLVI: 188, 1920.

I have seen only three male specimens of this species, two from California including the type, and one from Alberta. The slender male of *attenuata* may be readily recognized by the dilated mid tarsal segments 2, 3 and 4, with their elongated curved apical thorns on posterior surface. Both cross veins of the wings in type are obscurely clouded.

Hylemya (*Delia*) *curvipes* Malloch

Hylemyia curvipes Malloch, Trans. Amer. Ent. Soc., XLIV: 316, 1918.

[5] Huckett, H. C. 1924. A systematic study of the Anthomyiinae of New York, with especial reference to the male and female genitalia. Mem. 77 N. Y. (Cornell) Agr. Exp. Station, (1923) figs. 5, 56.

[6] Huckett, H. C. 1934. Notes on Francis Walker's type-specimens of North American anthomyid flies in the British Museum, (Muscidae, Diptera). Canad. Ent., LXVI p. 133.

The male of this small species may be readily distinguished by the abnormal extra length possessed by hind legs, the femora of which are curved or bowed upwards; the hind tibia is extensively setulose on both antero- and posteroventral surfaces; the inner margin of each process of fifth abdominal sternum has a prominent black apical spinule directed ventrad.

I have seen specimens of *curvipes* from Alberta, British Columbia, Georgia, Illinois (types), Indiana, Kansas, Manitoba, Maryland, Michigan, New Brunswick, New York, Quebec.

Hylemya (*Delia*) *fabricii* (Holmgren)

Aricia fabricii Holmgren, Öfversigt af Kongl. Vetenskaps.-Akadamiens Förhandlingar, (1872) XXIX (6): 101, 1873.

The male of *fabricii,* in my opinion, may be distinguished from such closely related forms as *propinquina* and *garretti* by the structure and bristling of the cerci. In *fabricii* the cerci tapers narrowly to its apex and the setulae likewise are gradually reduced to minute hairs.[7]

I have seen specimens of *fabricii* from Alaska, Colorado, Greenland (types), Manitoba, Montana, Ontario, Oregon, Quebec.

Hylemya (*Delia*) *garretti* Huckett

Hylemyia garretti Huckett, Canad. Ent., LXI: 117, 1929.

The males of *garretti* and *propinquina* are much alike, and evidently both are akin to *fabricii.* I differentiate the male of *garretti* from the two others by the smaller cordate cerci and by the denser longer setulae at apex. In both *garretti* and *propinquina* the ventral border of tergum 9 (anal sclerite) is less conspicuously setulose than in *fabricii,* and the posterior apical thorns of mid tarsal segments 3 and 4 more conspicuously developed.

I have seen males of *garretti* from Alaska, British Columbia (types), California, Colorado, Manitoba, Washington.

Hylemya (*Delia*) *gracilipes* Malloch

Hylemyia gracilipes Malloch, Trans. Amer. Ent. Soc., XLVI: 187, 1920.

The type of *gracilipes* lacks the typical dorsal series of mid metatarsal bristles, and only in one specimen, from Washington, have I found this character fully developed. In the majority of specimens, including paratypes, the dorsal bristles are poorly developed, being few and restricted proximad. The tibiae of the male of

[7] Ringdahl, O. 1949. loc. cit., p. 50, fig. 2.

gracilipes range in color from yellow to completely fuscous, and frequently the pairs, from front to rear, become successively paler or increasingly testaceous.

I have seen males of *gracilipes* from Alberta, British Columbia, Colorado, Montana (types), Oregon, Washington, Wyoming, Yukon Territory.

Hylemya (*Delia*) *ineptifrons* Huckett

Hylemya (*Delia*) *ineptifrons* Huckett, Proc. Ent. Soc. Wash., LIII (5) : 58, 1951.

I have seen only two male specimens of *ineptifrons,* and in these the dorsal setae on mid metatarsus are arranged in coarse series and vary in degree of development. The species is related to *setiventris* Stein, being distinguished in both sexes by the robust apical posterodorsal bristle on hind tibia, and in the male by the dichoptic eyes and in the structure and bristling of fourth abdominal sternum.

The species is known to me by the original series from Idaho, Nevada, Utah, Washington.

Hylemya (*Delia*) *liturata* (Meigen)

Anthomyia liturata Meigen, Syst. Beschr., VII: 329, 1838.[8]

Aricia florilega Zetterstedt, Dipt. Scand., IV: 1555, 1845.[9]

Chortophila trichodactyla Rondani, Atti Soc. Ital. Sci. Natur., IX: 164, 1866.

The male of *liturata* may be readily distinguished from allied forms by the uninterrupted series of short erect bristles throughout the distal half of posteroventral surface of hind femur, and by the invariably extensive series of semierect setulae on the same surface

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Explanation of Plate III

Male copulatory appendages, showing dorsal and lateral aspects of abdominal tergum 9 with bristles removed, ventral aspect of sternum 5.

Figures 1, 2, 3. *Hylemya* (*Delia*) *simulata* new species. Figures 4, 5, 6. *Hylemya* (*Delia*) *liturata* (Meigen). Figures 7, 8, 9. *Hylemya* (*Delia*) *cilicrura* (Rondani). Figures 10, 11, 12. *Hylemya* (*Delia*) *sancti-jacobi* (Bigot).

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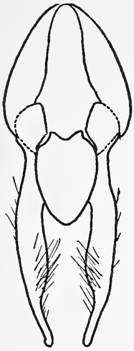
[8] *teste* Séguy, E. 1937. Genera Insectorum, Fasc. 205 p. 100.

[9] *teste* Ringdahl, O. 1939. Opus. Entom., IV (3–4) : 148.

Plate III



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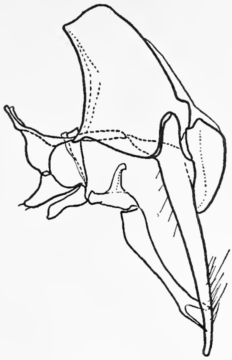

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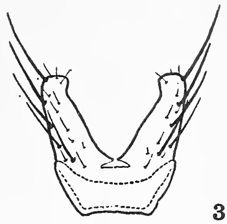

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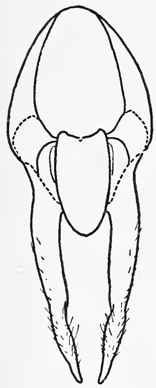

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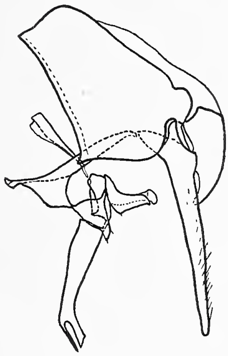

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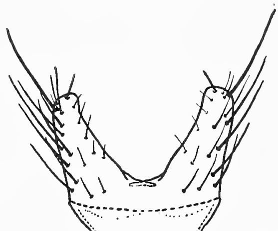

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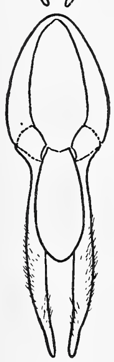

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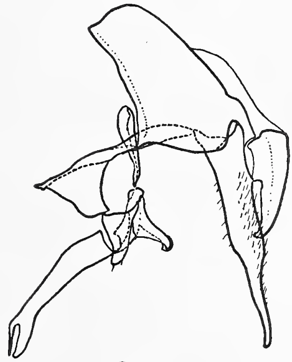

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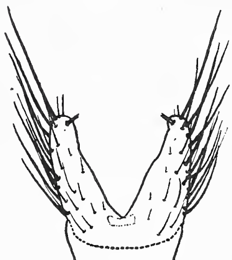

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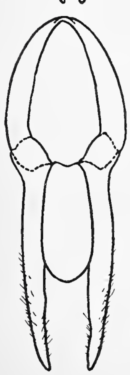

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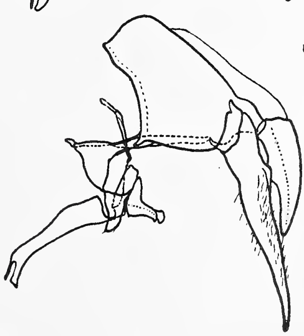
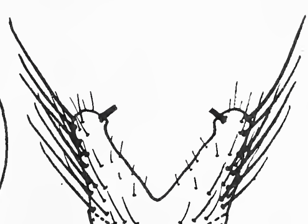


11



12

of hind tibia. Stein[10] has cited the South American species *Anthomyia sancti-jacobi* Bigot as a synonym of *C. trichodactyla* Rondani, but with this I hesitate to agree after examining a male of *sancti-jacobi* identified by Mr. Collin and compared with Bigot's type, and after seeing specimens determined by Malloch from the British Museum (Natural History), kindly furnished by Dr. van Emden. In the case of the latter, one of the specimens has an uneven series of weak miscellaneous bristles along distal half of posteroventral surface of hind femur that I do not consider indicative of the character as possessed by *liturata;* in the other specimen the posteroventral surface of hind femur is bare except for a single (spurious) short bristle at middle of one of the femora. The copulatory appendages of Collin's specimen are illustrated in figures 10–12.

I have seen specimens of *liturata* from Alaska, Colorado, Maine, Michigan, New Hampshire, New Mexico, New York, Nova Scotia, Ontario, Oregon, Quebec, Washington, Wisconsin.

Hylemya (*Delia*) *neomexicana* Malloch

Hylemyia neomexicana Malloch, Trans. Amer. Ent. Soc., XLVI: 310, 1920.

The male of *neomexicana* normally does not possess a dorsal series of setae on mid metatarsus. I have seen however an aberrant specimen taken by Mr. C. B. D. Garrett at Keremeos, British Columbia, on June 17,, 1923, in which this character was fully developed.

I have seen typical specimens of *neomexicana* from Alberta, British Columbia, California, Colorado, Idaho, Montana, New Mexico (type), Oregon, Utah, Washington, Wyoming.

Hylemya (*Delia*) *propinquina* Huckett

Hylemyia propinquina Huckett, Canad. Ent., LXI: 118, 1929.

The species *propinquina* closely resembles *fabricii,* the male differing in my opinion from the latter by the longer setulae at apex of cerci, sparser setulae along ventral border of ninth tergum (anal sclerite), and by longer apical thorns on posterior surface of mid tarsal segments 3 and 4.

I have seen males of *propinquina* from Alberta (types), British Columbia, Idaho, Montana, Oregon.

[10] Stein, P. 1907. Revision der Bigot'schen und einiger von Macquart beschriebenen aussereuropäischen Anthomyiden. Zeitschr. f. System. Hymen. u. Dipt., VII (4) : 286.

Hylemya (*Delia*) *setitarsata* Huckett

Hylemyia setitarsata Huckett, Mem. 77 N. Y. (Cornell) Agr. Exp. Sta., (1923) p. 32, 1924.

The male of this small species may be readily recognized by the setulose character of dorsal surface of hind tarsus, and by the presence of numerous bristles on distal half of mid tibia.

I have seen specimens of *setitarsata* from Georgia, Massachusetts, Michigan, New Brunswick, New York (types), Wisconsin, all collected in April or May except one specimen taken in early June.

Hylemya (*Delia*) *setiventris extensa* Huckett

Proc. Ent. Soc. Wash., LIII (5): 257, 1951.

In the few male specimens of *setiventris extensa* that I have seen the mid metatarsus has a coarse series of moderately long dorsal setae which I consider of sufficient prominence to warrant the inclusion of this subspecies in this study. The male of *extensa* differs from that of *setiventris* in that the fourth abdominal sternum is more deeply emarginate and the tips of apical bristles on the sternal lamellae extend beyond apex of abdomen.

I have seen specimens of *setiventris extensa* from Alaska (types), California, Idaho, Montana, Oregon, Washington.

Parasites on Quail.—A collection of parasites from quail was received from W. Blair Low of Las Vegas, Nevada. The specimens all were taken in southern Nevada. Mr. Low indicated that the ticks were from birds collected in a *Cowania-Juniperus* plant association at 4,000 feet elevation. Dr. F. C. Bishopp reported the material to consist of 13 larvae of the fowl tick, *Argas miniatus* Koch, slightly to 2/3 engorged. In addition, one larva of *Ixodes* species was taken. Hippoboscidae from quail were collected at Gord Springs, Lincoln County, Nevada, December 12, 1950. These were identified by Dr. A. Stone as *Stilbometopa impressa* (Bigot).—G. F. Knowlton, Logan, Utah.

ENZYMES IN INSECTS: ALKALINE PHOSPHATASE.

By Morris Rockstein and M. David Inashima,[1]
Pullman, Washington.

Introduction

In an earlier report, Rockstein and Levine (1951) presented data on the comparative activity of the acid phosphatase hydrolyzing sodium β-glycerophosphate for five species of insects. Chiefly histochemical, qualitative studies on the alkaline enzyme by Yao (1950a, b) on the developing embryo and preimaginal stages of *Drosophila melanogaster,* by Day (1949) on immature and adult stages of a variety of species of insects, by Bradfield (1946, 1951) on the goat moth larva (*Cossus cossus*), the silkworm (*Bombyx mori*), and several species of spiders, and by Denucé (1952) on two varieties of *Bombyx mori,* all tend to confirm Moog's (1946) summary of the possible role of alkaline phosphatase; in histodifferentiation, cuticle synthesis, transport across a gradient barrier, nucleic acid and silk synthesis, etc., in invertebrates as well as in vertebrates.

The object of this paper is to present a summary of comparative activity of the alkaline enzyme, studied at a pH of 8.1, in the same species in which the acid enzyme had been studied previously (Rockstein and Levine, *op. cit.*), as well as the large milkweed bug (*Oncopeltus fasciatus*), a species commonly employed in laboratory studies of a physiological or insecticidal nature. Data are also presented for each sex of the American roach (*Periplaneta americana*) as well as for the normal and resistant (Orlando #1 colony, topically exposed to DDT for 110 generations) strains of the house fly (*Musca domestica*).

Method

Instead of being decapitated, insects were collected and inactivated in a jar previously stored at –25° C, counted and weighed, and homogenized according to the method described by Rockstein and Herron (1951). Check determinations of acid enzyme activity were made at the same time, at a pH of 5.4. Also the number of individuals of *P. sericata* homogenized and made up to a final

[1] Laboratories of Zoophysiology, State College of Washington. This investigation was supported in part by funds provided for biological and medical research by the State of Washington Initiative Measure No. 171.

TABLE I

PHOSPHATASE ACTIVITY IN SEVERAL SPECIES OF INSECTS

Species	Age	Number of Individuals in 50 Ml.	Average Body Weight in Mg.	Measured Activity in μg. P/0.2 ml./1.5 Hr.		Activity in Mg. P/Gm./Hr.	
				Acid	Alkaline	Acid	Alkaline
Apis mellifera L.	< 22 hr. adult worker	20	109.6	8.08	7.77	1.84	1.78
	< 22 hr. adult drone	5	259.1	49.50	3.03	19.10	1.17
Musca domestica L.	< 20 hr. adult (N)	50	12.3	7.01	0.87	5.70	0.71
	< 22 hr. adult (R)	50	14.2	7.37	1.59	5.16	1.11
Tenebrio molitor L.	3.4 cm. larva	20	242.9	4.17	2.95	0.43	0.30
Oncopeltus fasciatus (Dall)	7–8 mm. nymph	17	21.5	2.32	0.95	3.18	1.31
	"adult"	20	40.4	7.22	1.58	4.46	0.98
Periplaneta americana (L.)	"adult" male	5	850.8	6.48	3.69	0.76	0.44
	"adult" female	5	944.8	6.20	2.67	0.66	0.28
Phaenicia sericata (Meig.)	< 22 hr. adult	50	13.9	0.71	0.98	0.51	0.71

diluted volume of 50 ml. was increased to 50 (over the 25 employed formerly) to obtain a low, but measurable, activity.

Results

Table I summarizes the pertinent data for the several species studied. (N) and (R) house flies refer to normal and resistant strains of this species, respectively. Data given under "Measured Activity" in each case represent median values from five replicate determinations from a single homogenate sample of 50 ml. containing the stated number of individuals, with the exception of a single determination only for the acid enzyme (check) determination for the adult drone honey bee.

Discussion

Check determinations of the acid enzyme compared with data of Rockstein and Levine (*op. cit.*) indicate a possible advantage of the cold-inactivation technique over the decapitation method previously employed. It should also be emphasized that *P. sericata* gives consistently very low *raw,* as well as *per weight,* data for both the acid and alkaline phosphatase when 50 individuals are homogenized. This is in contrast to the report by Rockstein and Levine (*op. cit.*) where the use of 25 individuals yielded raw data too low for accurate spectrophotometric determination by even this sensitive method.

In four species it is seen that the alkaline enzyme activity is lower than that of the acid phosphatase, both on a *raw data* and a *per weight* basis. An especially marked contrast is seen between the activities of these two enzymes in the case of the adult drone honey bee. This relationship is reversed in the case of *P. sericata,* while in the adult worker honey bee no appreciable difference between the two enzymes is apparent. Other studies (to be published) on these enzymes in relation to age in the adult worker honey bee indicate a marked increase in the acid enzyme activity within about ten days following emergence, while the alkaline enzyme shows a fall in activity after about the same period of time.

Differences in alkaline enzyme activity between male and female honey bees, male and female roaches, and between male and female flies, plus observed differences between resistant and normal house flies suggest that age, sex and variety are important factors to be considered in quantitative studies involving this enzyme system. The consistent difference in the alkaline enzyme activity of resistant and normal house flies suggests a possible relation of this enzyme

to the detoxification mechanism in DDT-resistant flies.

From a practical standpoint, scrutiny of the raw data indicates that all species employed, with the exception of *P. sericata,* would be useful for total homogenate studies of alkaline phosphatase. From a theoretical standpoint, it should be noted that the activity of the alkaline enzyme per gram of body weight, as compared to the acid enzyme, is consistently low in practically all species studied. The significance of such differences must await elaboration of the possible role of these enzymes, by further histochemical and biochemical studies; the sarcosome enzyme studies of Watanabe and Williams (1951) suggest another microbiochemical approach to this problem, by which parallel phosphatase studies might be made.

Acknowledgment

The authors acknowledge their appreciation to Dr. Horace S. Telford and Mr. Herman Menke for their kind cooperation in making available bees for this study. To Dr. A. W. Lindquist of the U.S.D.A., Corvallis, Oregon, are due thanks for his generous supply of house fly pupae of normal and resistant strains.

Summary

Alkaline phosphatase activity is reported for six different species of insects and compared with the acid enzyme. Raw data for the honey bee, house fly, American roach, large milkweed bug, and the yellow mealworm, indicate that these species are all suitable for quantitative studies involving this enzyme.

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A SIMPLE DROSOPHILA TRAP FOR WET WEATHER COLLECTING

By D. D. Williams, Urbana, Illinois.

When an ecological study of *Drosophila* is undertaken, it becomes necessary to make collections during all seasons of the year. One of the most difficult periods in which to collect is during damp weather. Open traps such as the bottle or paper cup fill with water, and in addition, the paper cups fall apart when saturated with water. As a result, very little collecting can be accomplished during a wet period.

The type of trap described here is illustrated in Figure 1. It consists of a lamp globe, a tight fitting glass cover for the base of the globe, a paper clip or short length of wire, a small paper "nut" cup to contain the lure, and a support for the globe, such as a ring stand as employed here. The distal two inches of the neck of the globe is painted black. In the upright position, the neck is directed downward with the covered base at the top.

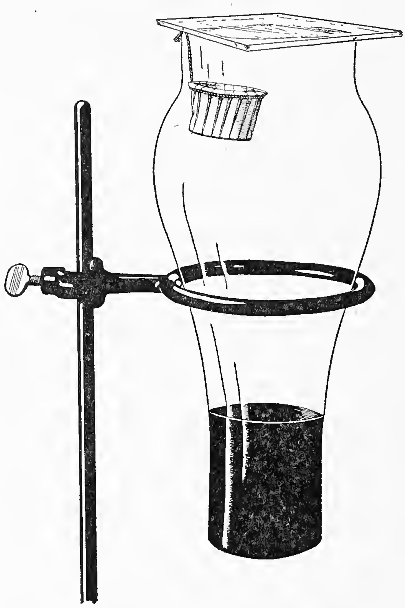

Fig. 1. A simple *Drosophila* trap for use in adverse weather.

The *Drosophila* follow the scent of the lure to the neck of the globe, and since most species of *Drosophila* are phototropic, they will fly up into the base of the globe where there is more light.

(The distal end of the neck is relatively dark since it has been painted black.) Because the *Drosophila* are very reluctant to fly down into a dark opening, they remain trapped in the more illuminated part of the globe.

To remove the specimens from this trap for examination in the laboratory, a cotton and gauze plug is inserted into the open end of the neck in the field. The *Drosophila* can then be etherized in the laboratory and dispensed in vials as desired.

A comparison of two collections made at the same time from one paper cup and one lamp globe under dry weather conditions is given in Table 1. It appears from this data that the only significant difference between the "catch" of each trap is the number of *Drosophila* caught. The various species of *Drosophila* were attracted to both types of traps. However, the globe type of trap described above is designed chiefly for use during adverse weather conditions.

This paper is part of a larger study recently completed on a phase of the ecology of *Drosophila melanogaster* which is being published elsewhere. The author gratefully acknowledges the invaluable suggestions and financial aid rendered by Dr. David D. Perkins of the Department of Biological Sciences, Stanford University, Stanford, California. This study was made at Stanford during 1949 and 1950.

TABLE 1

A COMPARISON OF TWO COLLECTIONS MADE BY THE PAPER CUP TYPE OF TRAP AND THE LAMP GLOBE TYPE TRAP UNDER IDENTICAL CONDITIONS.

Paper Cup Type Trap

Species	Oct. 12	Oct. 13
D. melanogaster	253	103
D. pseudoobscura	1	1
D. melanopalpa		1
	254	105

Lamp Globe Type Trap

Species	Oct. 12	Oct. 13
D. melanogaster	114	60
D. pseudoobscura	1	
D. melanopalpa	2	
D. busckii		1
	117	61

A RACHEOSPILA SPECIES FROM TULARE CO. CALIFORNIA APPARENTLY UNDESCRIBED

(Lepidoptera, Geometridae)

By JOHN L. SPERRY, Riverside, California.

In 1944, while the author was studying the genus *Chlorosea* Packard, there appeared in a box of Hemitheinae, on loan from the Los Angeles County Museum, a single male of a fine species which the author did not recognize but then considered probably belonging to the genus *Nemoria.* This spring a good series of this species was brought to the author by his good friend Christopher Henne of Glendora, California and the long palpi of a female in the series showed that the insect belonged to the genus *Racheospila* Guenee not fitting too well in either I or II of Prout's divisions. It is probably best placed in section II for vein 8 of the secondaries anastomoses shortly with the cell, 6 of the primaries is approximately connate with 7 and the abdomen carries embossed white distal spots. However, the male antennal pectinations are definitely short.

Racheospila hennei sp. n.

Male and female. Front and vertex dull rose, white between the antennae, neck green, antennal shaft white becoming ocher distally. Legs; coxa and femur green, darker inwardly, tibiae and tarsi rose. Palpi in females long, 2½ times the diameter of the eye, third joint long, rose. Thorax chromium-green, abdomen green laterally and beneath, dorsally decorated with rose triangles pointed toward the thorax, in all except the last two segments in which the triangles point backward, and decorated with central white spots. Spot and rose triangle in first segment, small, on second, large, on third about as on first, fourth, fifth and sixth segments have entire dorsal area roseate, the color extending slightly down each side, fourth and fifth segments have large white spots, sixth, seventh and eighth have none. Rose triangle on seventh and eighth segments small.

Forewings: chromium green, costa narrowly rose-pink from base to apex. T.a. line white, heavy, ½ mm. broad, from 1/3 out on costa curves slightly and irregularly outward to inner margin at 2/5. T.p. line heavy, nearly straight from costa at 2/3 out to inner margin at 4/5. Terminal line narrow, unbroken, rose. Fringe rose-pink, whitish basally, slight rose-pink checkering at ends of veins. Discal dot rose-brown, small. Hindwings: concolorous with primaries, t.a. line more evenly rounded than on forewing,

from 1/3 out on costa to 1/3 on inner margin; t.p. line subparallel to outer margin, 2/3 out. Tiny rose-brown discal dot, terminal line and fringes as on primaries. Beneath as above but less bright. Expanse 28 to 32 mm.

Holotype ♂, Smoky Valley, Tulare Co., California, June 15, 1945, 6300 ft. elevation, C. Henne, coll. and in the Sperry Collection.

Allotype ♀, same data June 18, 1943 and in the Sperry Collection.

Paratypes, 19 ♂ 7 ♀, June 7 to 19, 1944 and 1945, C. Henne, Coll.; 6 ♂ 5 ♀, June 16 to July 3, 1951 and 1952, Charles H. Ingham, Coli.; 1 ♀ Lower Chimney Meadows, Tulare Co., Calif. June 19, 1943, C. Henne; 1 ♀ Quaking Aspen, Tulare Co., Calif. June 20, 1936; and 2 ♂ Greenhorn Mountains, Calif. July 2, 1937, M. L. Walton, collector.

It gives me much pleasure to name this interesting *Racheospila* in honor of my friend of long standing, Mr. Christopher Henne, of Glendora, California, able entomologist in his own right and indefatigable collector among the mountains and on the deserts of the Southwest. We are in his debt for much that we know of the habitat of the lepidoptera of this interesting region. May his Coleman lanterns twinkle for many years to come among the pleasant places of this our hunting ground.

Superficially this species seems closest to *glaucomarginaria* B. & McD. being about the same size, with much heavier lines and with terminal lines and fringes rose instead of ocher. The lines are more nearly as in *obliqua* Hulst, but heavier, the insect is much larger and the rose more intense. Insofar as the genitalia are concerned, *hennei* is unlike either of these species but closer to *obliqua*. In the ♂ the uncus is spatulate, somewhat as in *festaria* Hulst, the socii are small pads, not long and well developed as in the others. The valvae are similarly square topped but lack the heavy chitinization of *glaucomarginaria* and *obliqua*. The projections at the base of the valves, which I have been calling furca arms for want of better name, are shaped like a calla lily petal in *hennei,* are flattened and mitten shape in *obliqua* and are spine-like and bifurcate in *glaucomarginaria*. The aedeagus is short, broad at the base narrowing to a sharp point apically in all three species, heavily toothed laterally for much of its length in *glaucomarginaria,* lightly toothed with a heavy, long terminal spine in *obliqua* lightly toothed at the base of the narrowed chitinized part and angled at the long, sharp tip in *hennei*. In the female genitalia the ostium is membranous in *hennei* and heavily chitinized in the others.

The species should probably be placed between *festaria* Hulst and *obliqua* Hulst in the North American list.

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Several years have passed since the publication policy of the Bulletin has been brought to the attention of the contributors. This opportunity is taken to restate the principles on which this publication operates.

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George S. Tulloch, Editor

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CERAMBYCIDAE AND CHRYSOMELIDAE from Asia and Pacific desired for determination; purchase; exchange.—J. Linsley Gressitt, Pacific Science Board, Bishop Museum, Honolulu, T.H.

WANTED—Psyche, vols. 11, 13, 15; Trans. Amer. Ent. Soc., vols. 1–5. C. F. dos Passos, Mendham, New Jersey.

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CONTENTS

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BULLETIN

OF THE

BROOKLYN ENTOMOLOGICAL SOCIETY

Vol. XLVIII APRIL, 1953 No. 2

CONCERNING SOME NORTH AMERICAN COREIDAE (HEMIPTERA).[1]

By Roland F. Hussey, Lakeland, Florida.

I.

Among some Hemiptera received from Dr. Cornelius B. Philip, of the Rocky Mountain Laboratory, U. S. Public Health Service, there are three specimens of *Theognis occidentalis* (Heidemann) from Ravalli County in extreme western Montana, collected by Dr. William L. Jellison in October 1935. The data on the labels suggest that these individuals were preparing for hibernation, as the two taken on October 20 were found in the nest of a hawk while the other, collected on October 3, was from the nest of a rodent.

Examination of these specimens led me to believe that *T. occidentalis* has been wrongly placed in the published keys to the North American *Leptoglossus*, in which genus this species has heretofore been located. This belief has been confirmed by measurements of Heidemann's type in the U. S. National Museum which Dr. R. I. Sailer obligingly made for me, and by examination of material from the Heidemann collection at Cornell University kindly loaned me for study by Drs. J. Chester Bradley and Henry Dietrich. Three of the seven specimens sent me from Cornell bear Heidemann's manuscript labels "*Leptoglossus occidentalis* n. sp." but the data on their locality labels do not correspond with any of the material mentioned under the original description. Therefore they cannot be considered as cotypes or paratypes. Two of the seven lack antennae entirely.

In his original description (1910, p. 196) Heidemann wrote of

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[1] Contribution from the Biology Department, Florida Southern College.

the antennae: "terminal joint darker and stout, nearly equal in length to the third joint." Gibson (1917, p. 70) apparently took this to mean that the fourth joint is shorter than the third, and Torre-Bueno (1941, p. 49) followed Gibson in this interpretation. Dr. Sailer writes me that the third and the fourth segments respectively of Heidemann's holotype are 2.77 and 3.00 mm. long (the apical node being included in the length of the third joint) so that the fourth is 8% longer than the third. In the specimens before me the fourth segment is from 12% to 26% (average 20%) longer than the third. Thus it seems that the type specimen designated by Heidemann does not represent the average condition but rather lies at or near the extreme of variation in the relative lengths of these two segments.

In the keys offered by Gibson and by Torre-Bueno these specimens all run out to *Leptoglossus oppositus* (Say), which is a very different species. In order to place them correctly Torre-Bueno's key should be rewritten as follows:

Theognis Stål 1862 (*Leptoglossus* auctt. nec Guérin)

1. Rostrum reaching to or slightly beyond middle coxae; antennal segment II one-half longer than III, segment IV longest; dilatation of hind tibia in both sexes less than two-thirds as long as the tibia, provided with three teeth; length 12-14 mm., width 5 mm. .... *brevirostris* (Barber) 1918

   Rostrum extending far beyond middle coxae, usually onto the abdomen 2
2. Apex of head (tylus) produced as a porrect spine which is as long as or longer than an eye; length 16–20 mm., width 4–6 mm. .... *clypealis* (Heidemann) 1910

   Apex of head rounded or pointed, tylus not spinosely produced 3
3. Pronotum very coarsely punctate or rugose, sometimes almost alveolate; hemelytra without a transverse fascia; head more than 2½ times as long as its interocular width; inner dilatation of hind tibia with several large teeth on the margin; length 18–25 mm., width 6–9 mm.
   fulvicornis (Westwood) 1842

   Pronotum not rugose, more or less finely punctate only; head shorter 4
4. Antennal segment IV equal to or shorter than III; outer dilatation of hind tibia lanceolate, not scalloped, reaching almost to apex of tibia; rostrum reaching or passing third ventral segment; pronotum with large dark dots; length 16–19 mm., width 4.5–6 mm. .... *corculus* (Say) 1832

Antennal segment IV commonly at least ⅛ longer than III, rarely (some specimens of *occidentalis*) more nearly subequal, in which case the pronotum is without large dots 5

5. Posterolateral margins of pronotum not crenulate or dentate 6

Posterolateral margins of pronotum more or less crenulate or dentate 7

6. Dilatations of hind tibia wider, the outer one distinctly longer and twice as wide as the inner one, its outer margin deeply scalloped; golden pubescence of scutellum and hemelytra sparse, uniform; antennae long, reddish, segment IV about 3/5 longer than III; transverse fascia of corium obsolete or represented by a short oblique line on one of the veins; scutellum nearly flat; length 18–20 mm., width 5–6 mm. . *oppositus* (Say) 1832

Dilatations of hind tibia narrower, the outer one scarcely longer and only one-half wider than the inner one, its outer margin not at all scalloped and with not more than one or two very short blunt teeth or tubercles on the distal part; lateral margins of pronotum anteriorly, a small median spot on the collum, and a subtriangular median area on the pronotum densely golden-sericeous, also with thicker golden pubescence at either side of the claval suture and on much of the apical third of the corium which is usually marked with a narrow transverse zigzag white line on the veins; antennae shorter, segment IV averaging about 1/5 longer than III; scutellum somewhat tumid, transversely depressed before the middle; length 16–18 mm., width 4–6 mm. . . . . *occidentalis* (Heidemann) 1910

7. Humeral angles with a prominent short spine; pronotum anteriorly with an arcuate transverse pale line, this sometimes reduced to two small spots; golden pilosity of head and pronotum extremely scanty; length 16–19 mm., width 5–6.5 mm. . . . . *gonagra* (Fabricius) 1775

Humeral angles not prominently spinose; pronotum without an arcuate pale transverse line 8

8. All margins of pronotum bright orange; foliations of hind tibia short; antennal segment IV slightly longer than II and more than one-half longer than III; rostrum barely reaching hind coxae, its fourth segment twice as long as the second; upper surface finely pilose; length 14–16.5 mm., width 5–6 mm. . . . . *ashmeadi* (Heidemann) 1909

Pronotum not bordered with orange; foliations of hind tibia large and long 9

9. Transverse white fascia of corium straight, entire, not wavy; dorsal pubescence sparse, not tomentose; pronotum usually concolorous, rarely with two lighter areas anteriorly, these if present not dotted with black; scutellum finely, sparsely pubescent; antennal segment IV about 2/5 longer than I; ventral surface finely silvery pilose; length 17–20 mm., width 5.5–6 mm. .... *phyllopus* (Linnaeus) 1767

   Transverse white fascia zigzag, following the veins; pubescence of dorsum long, heavy, almost tomentose; pronotum anteriorly with two round yellowish areas which are dotted with black; scutellum with close, very thick silvery hairs; antennal segment IV from 55% to 80% longer than I; length 17–21 mm., width 5.3–7 mm. *zonatus* (Dallas) 1852

II.

When the existing keys in the American literature are used, *Theognis occidentalis* runs not only to the wrong species, but even to the wrong genus. In fact, most of its North American congeners come out in *Narnia* rather than in *Theognis* (or *Leptoglossus*).

These two genera were first erected by Stål (1862, p. 294), who later found it necessary to redefine them (1867, p. 544) in his keys to the American coreid genera. In the latter work he stated that *Narnia* has the first antennal segment as long as the anteocular part of the head, while in *Theognis* this segment is subequal in length to the entire head or longer, *at least, than the anteocular part* (italics mine).

In their keys to the American genera of Anisoscelini Gibson and Holdridge (1918, p. 3) omitted under *Leptoglossus* the words italicized above, and defined *Narnia* simply as having the first antennal segment shorter than the head. The characters they employed were thus essentially those given by Stål in 1862 for separating the two genera. Blatchley (1926, p. 219) noted that two of the eastern species of *Leptoglossus* do not conform to the characterization of Gibson and Holdridge, but did not comment farther. Torre-Bueno (1941, p. 48) nevertheless followed precisely in the footsteps of Gibson and Holdridge in his generic key.

The ratios of the length of the first antennal segment (1) to the length of the entire head, and (2) to that of the anteocular part, vary considerably in different species of *Theognis* and even in different individuals of the same species. Thus in *T. phyllopus* the former ratio ranges from 0.82 to 0.95 and the latter ratio from 1.56

to 1.92, while in *T. gonagra* the ranges are respectively 0.81 to 0.91 and 1.47 to 1.70, the head being measured only to the apex of the jugae in each case. The ratios are somewhat smaller in the five other North American species I have examined and in several others from Mexico, and reach their minima in *T. corculus* where they range from 0.64 to 0.66 and from 1.08 to 1.14 respectively. By way of comparison, in *Narnia femorata* and *N. snowi,* of which specimens are before me, the ranges are 0.48 to 0.56 and 0.97 to 1.03 respectively.

Theognis was made a synonym of *Leptoglossus* Guérin 1838 by Stål himself (1870, p. 160) and was so treated by subsequent writers until Kiritshenko (1935, p. 191) restored it to the status of a distinct genus. *Leptoglossus* appears thus far to contain only its genotype, *L. dilaticollis* Guérin, from Brazil, and the other species heretofore assigned to it are properly referable to *Theognis.*

Kiritshenko's paper is relatively unknown in this country, and I have therefore included *Leptoglossus,* though extralimital, in the following revised key to the North American anisosceline genera, using the characters he employed to distinguish it from *Theognis.*

1. Second and third antennal segments dilated on two sides. *Chondrocera* Laporte.
   Second and third antennal segments simple 2
2. First antennal segment subequal in length to the anteocular part of the head, never equal or subequal to the length of the entire head; hind tibiae more narrowly dilated, the outer dilatation not scalloped .... *Narnia* Stål
   First antennal segment most commonly at least one-third longer than the anteocular part of the head, sometimes as long as or longer than the entire head, most rarely (*T. corculus*) subequal to the anteocular part; hind tibiae commonly more widely dilated, especially on the outer side, the outer dilatation usually scalloped 3
3. Head narrow, long, porrect, three times as long as its width between the eyes; pronotum with the lateral angles extended in a very long curved process, directed forward and slightly upward, the lateral margins dentate, the surface both above and below lightly punctate and with deeply excavated rounded foveolae, especially at the front and sides; body robust, the type species 30 mm. long. [Extralimital.] *Leptoglossus* Guérin.
   Head shorter, never three times as long as its interocular width; pronotum with the lateral angles lightly prominent, some-

times shortly spinose, the lateral margins commonly entire, the upper and lower surfaces without excavated foveolae; size mediocre .... *Theognis* Stål

III.

The characters given by Torre-Bueno (1941, p. 76) for separating *Coriomeris* and *Ceraleptus* are, in my experience, not workable. These two genera are, however, easily distinguished from one another by the characters employed by Stål (1872, p. 53) in his key to the European genera of Coreidae, the hind coxae of *Ceraleptus* being contiguous or nearly so while those of *Coriomeris* are distant from one another.

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ADDITIONS TO VESPINE BIOLOGY XI: DEFENSE FLIGHT.

By Albro T. Gaul, Brooklyn, N. Y.

One of the best known characteristics of the Vespine wasps is their ability to defend their nests. Because of the potential discomfort likely to accrue to the investigator, it is also without doubt the least studied Vespine activity. This paper is the result of a number of years' experiences and some definite experiments on the defensive actions of these wasps.

It has been noted that the hornets and yellowjackets seldom exhibit defensive stinging actions in the field. They may be brushed from blossoms or from animal prey with the greatest impunity. When disturbed in the field, the wasp may attempt to return to its source of food, or it may seek other food. Within my experience, wasps will only attempt to sting in the field when they are trapped in a collecting net or any other enclosed object.

When any disturbance occurs at the nest site, however, defensive flight is in order. It is noteworthy that wasps do not seem to communicate their social unrest to their nest mates. While some wasps are flying out in response to a stimulus, the ordinary foragers who return to the nest, make no defensive effort unless the nest is disturbed while they are actually within it. Many times I have carefully grasped a single wasp at its nest entrance and removed it for various purposes, without disturbing the nest itself. No wasps flew to its defense. Yet when the nest structure was inadvertently jostled, workers would respond quickly. It is thus apparent that defense flight is a response to nest disturbances rather than to individual disturbances.

It has been noted among most species, that the number of wasps responding to a stimulus is roughly proportional to the extent of the disturbance. In one experiment, a nest of *Vespula maculifrons* Buy. was struck with a 5 gram weight dropped on the nest envelope from a height of 10 centimeters: 8 workers flew out in defense. A few minutes later, the same nest was struck with a 20 gram weight from the same height: at least 25 workers were counted in flight as a result of this stimulus. Similar experiments have shown the same general pattern but are not worth recounting here.

The nature of the defense flight is of significance. The response to the disturbance begins while the wasps are in the nest. Thus they do not see the source or direction of the disturbing source. In

flying from the nest, their paths are much like their orientation flight paths; a type of flying in ever expanding arcs. The location of the enemy by one wasp does not locate the enemy for all wasps. Each wasp must find its target for itself. The experimenter who remains motionless as the wasps emerge from the nest, is in much less peril than the experimenter who makes a moving target out of himself. I have found that I can stand motionless at ten feet from the nest with more safety than when I move about at 25 feet.

The popular conception of the vindictive hornets chasing the victim over hill and dale for miles is, like most popular conceptions, somewhat in error. Never within my experience has a wasp made a defense flight further than 25 feet from the nest. If, however, the experimenter remains within this distance until he is discovered by one or more wasps, they immediately establish a phoretic relationship with him, and may remain on his person while he extends his distance from the nest to 200 or 300 feet. The duration of the defense flight is a variable, depending to some extent upon extrinsic factors. Upon leaving the nest in defense, most wasps will return after a 90 second search for their assailant. Should the day be particularly warm, the duration of these flights may extend up to 5 minutes. If, as has already been suggested in the paragraph above, the wasp encounters the disturber, the duration of the defense flight is prolonged by this contact. In general, when the temperature is 29° C. or lower, the defense flight will continue for approximately 90 seconds. By this time, the stimulus seems to be forgotten, because the disturber can approach the nest with the returning wasps with no fear of being stung.

It has been noted that the apparent value of the defense threshold is considerably lower in warm than in cool weather. The warmer the weather, the more wasps respond to the same stimulus, and moreover some wasps respond to smaller stimuli. When it is warmer, the wasps will spend more time searching for the intruder. It seems probable from this evidence that the duration of the defense flight is a function of temperature, although no exact figures are ready for publication at this time. Since time-temperature reactions are common in enzyme activity, it would be worth further study to determine the exact nature of this mechanism.

It is significant that wasps can become conditioned to nest disturbances. In July, 1947 I had suspended a nest of *Dolichovespula arenaria* Fab. from wires near an open window. As the wind blew, the nest would strike the window sill. At the beginning, the wasps were aroused each time the nest made this contact. After the second week in this position, not a single wasp bothered to investigate

when the nest touched the window sill. Even gentle tapping on this nest with a stick failed to evoke the usual defensive action.

In making their defensive flights, most wasps fly directly from the nest in search of their tormentors. A common trick of *V. rufa* var. *consobrina* Sauss. however, is greatly divergent from this habit, and usually results in the location and eventual discomfort of the experimenter who may be unaware of the divergence. The nests are usually subterranean. When the workers emerge on a defense mission, they fly less than ten feet before they drop to the ground. The unwary experimenter, seeing no defenders in flight may return to the nest site, whereupon the workers on the ground will climb upon any part of the anatomy, showing great disrespect. Since this has happened in a number of different colonies of this species, it is to be presumed that it is, perhaps, a typical habit of the group. It is not known whether this is generally true of all varieties of *V. rufa,* or whether it is restricted to *consobrina.* I have previously stated[1] that this species is mild tempered. Its habit of working from the ground may account for this in part; although I believe it has a relatively high threshold to disturbances.

It has therefore been shown that wasps are unlikely to sting in the field; that their defense activities are largely confined to the nest area; that the number of wasps responding to a disturbance is roughly proportional to the extent of the stimulus, the temperature, and the conditioning of the individuals; and that the time spent in searching for a target is roughly proportional to the temperature.

Reference

(1) **Gaul, A. T.** 1948. Notes on *V. rufa* var. *consobrina* Sauss. Bull. Brook. Ent. Soc., XLIII, p. 160.

NOTICE

The Department of Engineering Physics of Cornell University, Ithaca, New York will give a special course in "Techniques and Applications of the Electron Microscope" from June 15 to June 27, 1953.

The course is designed for those research workers who have recently entered the field of electron microscopy. Further inquiries should be addressed to Professor Benjamin M. Siegel, Rockefeller Hall, Cornell University, Ithaca, New York.

FIELD NOTES ON NEORHYNCHOCEPHALUS SACKENII (WILLISTON) IN MISSOURI

By Robert A. Dietz, Knoxville, Tenn.[1]

During the summer of 1949 I found myself in a locality where for a time the adults of *Neorhynchocephalus sackenii* were quite common. This was at the Washington University Farm, 7 miles S. W. of Clarksville, Pike County, Missouri. Although I was engaged primarily in a botanical study, the actions of these flies captured my interest to the extent that I spent many hours in the field observing them. Some of the notes I took at the time may be of interest to other naturalists. The fly's identification was made by Dr. J. Bequaert of the Museum of Comparative Zoology at Harvard, who informs me that the species is now recorded for the first time from Missouri.

The flies came to my attention by the noise they made in flight. Usually I heard the fly, turned and saw it hovering, whereupon I would sit on the grass for comfort. After a time the fly would alight on a grass stalk, and the observation period would begin. Its attitude when it alights somewhat resembles that of a Damsel Fly, *i.e.*, the six legs reach out in front and grab on to a vertical stalk. The body rests off to the side at an angle approaching the horizontal. When in this attitude the fly is not easily flushed. It is possible to approach to within about 18 inches for a close look. The flies remained still unless I made an "overt" move, when the wings would flutter slightly, preparatory to taking off. During these observation periods I never was able to out-wait the flies. I tired after about an hour, and when I arose my quarry would fly away.

In flight these flies made a very distinctive sound, so distinctive that almost without exception it was the sole means I used to locate them. The tone was clear, resonant and very steady—the latter characteristic serving to distinguish them from other similarly sounding flies and bees. When hovering, the tone emitted is F on the musical scale at 90° F, as determined with the aid of a tuning fork. When alarmed the tone drops a major third as the fly darts away with great speed in a straight line.

The flies were active during all daylight hours from July 28 to August 15. None were attracted to a light I installed in the pasture. Females were common, but I only captured one male. Oddly enough they appeared only in one portion of the 3-acre pasture where I found them, and not in any other similar pastures which I visited in other parts of the same county.

[1] Botany Department, University of Tennessee.

I recorded a curious phenomenon which I pass on without comment. In life the eyes are a striking, almost irridescent blue-green. After a short time in the cyanide jar they become dull reddish-brown. But when captured in a net, before placement in the jar, the eyes turn a fiery orange.

Professor Bequaert tells me that, so far as is known, the early stages of our Nemestrinidae parasitize grasshoppers. *N. sackenii* was bred in British Columbia by Spencer (1945) from *Melanoplus mexicanus,* and by York and Prescott (1952) in Mountana from *Melanoplus mexicanus, M. alpinus, M. dawsoni, M. infantilis* and *Encoptolophus sordidus costalis.* It seems to confine its attacks to the Acrididae. Of this family the following were most abundant in the pasture at the University Farm at the time of observation: *Melanoplus differentialis; M. femur-rubrum; M. mexicanus; Arphia xanthoptera; Dicromorpha viridis; Orphulella speciosa; Orphulella* sp.; *Neotettix* sp.; *Hippiscus* sp.; *Dissosterira carolina.*

Robertson (1928) observed *N. sackenii* at flowers of Yarrow (*Achillea Millefolium*) in Illinois. This ubiquitous weed was found in our pasture along the fences; but none of our flies were observed visiting flowers. In the collecting area the most abundant Composite in bloom was Chickory (*Chichorium intybus*), and the disappearance of the flies coincided with the mowing which cut these plants back.

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A Note on the Swarming Habits of Ogcodes dispar (Macq.) On July 12, 1952, a number of flies identified as *O. dispar* by Dr. C. W. Sabrosky were seen swarming about twelve feet above the ground in a heavily wooded area at the edge of a logging trail. The individuals were flying back and forth in a zig-zag fashion and occasionally one would detach itself from the group and spiral down to alight on the upper leaves or twigs of a white ash (*Fraxinus americana* L.). This sapling measured about 4½ to five feet in height; and although there were other small trees and shrubs in the vicinity, the cyrtids landed only on this particular tree. Sabrosky (1948) (American Midland Naturalist. 31: 385–413) noted that a similar, although not quite so restricted prefer-

ence for a particular resting place was exhibited by *Ogcodes eugonatus* Loew.

Seventeen males and one female were taken on July 12, and four more males were taken the following day. The flies were very alert and all specimens taken were captured in a net. Sabrosky was able to collect specimens of *eugonatus* by placing a collecting bottle over them or by picking them up with his fingers as the flies rested on twigs.

These observations were made in an area called Rattlesnake Gutter, Leverett Township, Franklin County, Massachusetts. The time was about 3:00 P. M., and it was in general a warm, humid afternoon with very little air movement.—Thomas H. Farr, Amherst, Massachusetts.

A new Prospinanura (Collembola) from North Carolina. This is the second species of this newly erected genus to be described, the first (*P. kardosia*) being described last year from Utah (see Bull. Brooklyn Ent. Soc. XLVII, p. 96). This form is similar in general body appearance, but differs in being without eyes, with 5 instead of 8 anal spines, and is without pigment.

Prospinanura oxfordi n. sp.

Length 0.6 mm. Entirely white in color. Mouthparts not produced in a cone. With well developed prothorax. With 5 large heavy long pointed spines on dorsum of last abdominal segment situated 3 in anterior row, 2 in middle row, and 1 on posterior of segment. With many longer bristles or setae on last segment, some situated laterally to the spines, and some on fifth segment. Clothing consists of short curving hairs over body. Antennae shorter than head or as 20: 25, with joints as 5: 5: 4: 6. The last 2 antennal joints are nearly fused but a faint demarcation is apparent ventrally. The first and second antennal joints are swollen and are much larger than the last two; somewhat telescopic. With several large curved sense setae on fourth segment, and a large terminal sense bulb. Eyes absent. Postantennal organ absent. Unguis falcate, untoothed. Tenent hairs absent. Unguiculus and furcula absent.

Type locality: Oxford, North Carolina. Collected from hardwood leaf mould on the banks of the Tar River, March 20, 1952, D. L. Wray. The type is deposited in the North Carolina Dept. of Agric. Insect Survey Collection at Raleigh, N. C.—D. L. Wray, Raleigh, N. C.

UNDESCRIBED SPECIES OF NEMATOCEROUS DIPTERA. PART II.

By Charles P. Alexander, Amherst, Mass.

In continuation of the series of papers instituted under this general title (Part I, Bull. Brooklyn Ent. Soc., 47: 88–94; 1952), I am here describing some further species of unusual interest. The types of the novelties are preserved in my personal collection.

Psychodidae

Horaiella kuatunensis n. sp.

General coloration of thorax dark reddish brown, the posterior sclerites much darker; wings virtually as in *consimilis;* male hypopygium with the basistyle not or scarcely fused with the ninth sternite; dististyle exceeding one-sixth the length of the body, its mesal face with about eight major spines.

Male: Length about 3 mm.; wing 3 mm.; antenna about 3 mm.

Rostrum and palpi brown. Antenna (male) very long, filiform, subequal to the body or wing, dark brown throughout; antennae apparently 16-segmented, the terminal segment about one-third the length of the penultimate; flagellar segments elongate-cylindrical, with short inconspicuous verticils; no modified ascoids on segments. Head dark brown.

Thorax almost entirely dark reddish brown, the posterior sclerites much darker; thoracic bristles very long and powerful. Halteres dark brown. Legs with the coxae dark brown, trochanters paler; remainder of legs light brown; terminal tarsal segment enlarged. Wings faintly tinged with brown, the veins darker brown. Venation: Virtually as in *consimilis,* as figured by Tonnoir, the forks of cells R_4 and M_1 lying at the same level, that of cell M_3 more basad.

Abdomen brown. Male hypopygium differing conspicuously from that of the genotype in the nature of the basistyle, which is not or scarcely fused with the sternite, appearing as large structures (0.45 mm.) that are about three-fourths as long as the dististyle and much stouter, the inner face with a row of about a dozen long slender bristles, the outermost small and weak, becoming progressively longer and stouter toward the base, the longest nearly equal to the diameter of the style opposite its insertion. . Dististyle long and slender (0.6 mm.), provided with about eight major spines along the mesal face, additional to a terminal bristle, the outer spines larger and more powerful, be-

coming weaker toward the base, the spines interspersed with more numerous small spinulae.

In the two Indian species, including the genotype, the coxites (basistyles) and sternite are fused into a large compact capsule. Further distinctions in the present fly involve the phallosome, where the aedeagus is Y-shaped, the stem stout, the arms slender, strongly divergent. Lobes of the ninth tergite with only two major bristles, these very long.

Habitat: Eastern China (Fukien).

Holotype: ♂, Ta-chu-lan, Kuatun, altitude 1500 meters, April 25, 1948 (Joseph Fu); through Dr. Hsiufu Chao.

In 1931, in the Teesta Valley, North India, Dr. Sunder Lal Hora, Director of the Indian Museum, discovered some remarkable new Psychodidae, belonging to two different genera, one of which was described as new by the late Dr. A. L. Tonnoir.[1] The new genus was named *Horaiella,* in honor of the distinguished collector, and included two species, the genotype, *prodigiosa* Tonnoir, and an allied species, *consimilis* Tonnoir. It was with great interest that a third member of this remarkable genus was discovered, living in the highest mountains of eastern China, some 2000 miles to the east of the type locality. The similarity of the wing venation of present fly to *H. consimilis* is astonishing but the structure of the male hypopygium, particularly the more generalized condition of the sternite and basistyle in the present fly, marks the two flies as being very distinct. It is of interest to observe that in this genus, at least, the wing venation proves to be more constant and reliable than does the structure of the male hypopygium.

Despite the objections raised by Tonnoir (l. c., p. 65) to the erection of subfamilies and other higher groups in the Psychodidae based on isolated genera, it seems impossible for me to place the present group in the Phlebotominae and I consider it to represent a distinct subfamily, the Horaiellinae, based on the single genus *Horaiella* Tonnoir, with the three species at present known. The characters of the subfamily are those of the genus, as well-defined by Tonnoir (l. c., p. 54).

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[1] Tonnoir, A. L. 1933. Descriptions of remarkable Indian Psychodidae and their early stages, with a theory of the evolution of the ventral suckers of dipterous larvae. Rec. Indian Mus., 35: 53–75, 7 text figs., 1 pl.

Blepharoceridae

Blepharocera williamsæ n. sp.

Size very large (wing, male, 7–8 mm., female, 9–10 mm.); males generally yellowish, especially the thoracic pleura, females more pruinose, including the thoracic dorsum; legs brown to dark brown; male hypopygium with the outer dististyle elongate, its apex obtuse, simple; gonapophyses extending caudad beyond the other elements of the phallosome, terminating in an acute spine; lateral penis filaments without flanges.

Male: Length about 6.5–7 mm.; wing 7–8 mm.; antenna about 1.7–1.8 mm.

Female: Length about 8–9 mm.; wing 9–10 mm.; antenna about 2.0–2.1 mm.

Female. Mouthparts yellow to weakly infuscated, the outer segments of the maxillary palpi paler, the terminal segment very long, nearly equal to the preceding three combined. Antennae unusually small; scape brownish yellow to yellow, pedicel brown to brownish yellow, flagellum black; flagellar segments cylindrical, approximately three times as long as broad. Face heavily gray pruinose; anterior vertex more blackened, especially surrounding the ocelli, at its narrowest point about as wide as the first flagellar segment.

Pronotum and mesonotal praescutum and scutum dark gray, the latter with three more blackened stripes, the median one gradually paling behind, extending to beyond the level of the suture; sides of praescutum and scutal lobes more blackened; median region of scutum lighter gray pruinose; scutellum reddish brown, more pruinose basally. Pleura with the mesopleura gray pruinose, lighter beneath, the posterior sclerites, meron and region of the wing root more yellowed. Halteres with stem yellow, knob dark brown. Legs with the coxae and trochanters pale, sparsely pruinose; femora brown, restrictedly yellowed basally; tibiae and tarsi darker brown; fore tibia slightly more than twice the basitarsus (4.2 : 2), mid-tibia (4 : 1.8); spur of middle coxa with short dense black setae. Wings subhyaline, costal cell and stigmal region infuscated, the color not passing the radial vein behind; prearcular and costal veins brown, the remainder brownish black to black. Venation: Cell R_2 at margin subequal to cell R_4.

Abdominal tergites dark gray basally, the posterior half or more blackened; sternites more reddish brown, sparsely pruinose. Ovipositor obscure yellow, the cerci projecting beyond the tips of the

hypovalvae, the apices with strong setae from elongate-cylindrical bases.

Male. Generally similar to the females, differing in coloration and in details of structure. Flagellar segments shorter, approximately twice as long as broad. Mesonotum with the ground color obscure yellow with three more brownish or chestnut brown stripes; pleura yellow with a light gray pruinosity, clearest on the more ventral pleurites. Halteres with knobs weakly darkened. Legs paler, brownish yellow.

Abdomen brown, the bases of the segments narrowly paler, the lateral margins narrowly, the posterior borders more broadly gray; hypopygium light brown. Male hypopygium with the outer dististyle elongate, its apex obtuse, simple. Inner dististyle relatively long, slightly expanded and obtuse at tip. Gonapophysis relatively stout extending caudad beyond the remaining elements of the phallosome, terminating in a strong spine, with a lateral tooth or shoulder at base of the latter; lateral penis filaments slender, with no indication of a flange; central filament with a weak flange on proximal half.

Habitat: Tennessee.

Holotype: ♀, Above Greenbrier Cove, Mount Leconte, Great Smoky Mountains, altitude 4200 feet, June 5, 1930 (C. P. Alexander). *Allotype:* ♂, Greenbrier Cove, altitude 2500 feet, April 22, 1939 (I. W. Williams). *Paratopotypes:* ♂♂♀♀, with the allotype, altitude 2000–2500 feet, April 22, 1939, May 15–22, 1938 (I. W. Williams); *paratype:* ♀, Bluff Mountain, Chilhowee Mountains, April 23, 1939 (I. W. Williams).

I take unusual pleasure in naming this net-winged midge for Dr. Inez W. Williams, to whom I am indebted for numerous Diptera from the Great Smoky Mountains. *Blepharocera williamsæ* is the largest and most conspicuous of the eastern North American species of the genus. In recent papers, *B. capitata* (Loew) has been ignored or placed in the strict synonymy of *B. tenuipes* (Walker), a course which I do not feel has been proven or justified. The type of the latter was from the Hudson Bay region of western Ontario (Albany River, flowing into James Bay at Latitude 52° N. Lat.), whereas the types of *capitata* were from the vicinity of Washington, D. C. In 1927, I collected specimens of a *Blepharocera* at Orient Springs, near Amherst, Massachusetts, and sent them to the late Fred W. Edwards, of the British Museum, as being *tenuipes*. It appears that Edwards compared the specimens with the type of *tenuipes* and finding it to be distinct sent

the Massachusetts specimens to Johannsen for description, the species then being defined as *B. similans* Johannsen (Psyche, 36: 123–124; 1929). Unfortunately Edwards provided no comparisons with the actual type of *tenuipes* and it still is uncertain as to how these two species differ, since it seems probable that in the comparisons made of *similans* with *tenuipes* by Johannsen, that the latter material actually refers to the more southern *capitata*. *B. similans* was found associated with the present fly in the various coves on the western slopes of the Great Smokies in 1938 and 1939.

Blepharocera williamsæ is by far the largest and most conspicuous of our eastern North American species so far made known. It differs from all species known to me not only in stature but also in the structure of the hypopygium, especially the phallosome. It may be emphasized that all males of the type series are more yellow than the gray females, but the association of the two as a single species appears correct.

Blepharocera zionensis n. sp.

General coloration of thorax light ochreous, sparsely pruinose, the praescutum with three more reddish stripes; mouthparts yellow; antenna with scape ochre yellow, flagellum black; terminal segment of flagellum nearly twice the penultimate; halteres and legs obscure yellow; wings nearly hyaline; abdominal tergites brown, sternites yellow; male hypopygium with the outer dististyle widened distally, the inner apical margin conspicuously emarginate; inner dististyle a short flattened spatula; gonapophysis extended into a long hairlike point; penis filaments with narrow dusky flanges on proximal third.

Male: Length about 5 mm.; wing 6–6.2 mm.

Mouthparts, including the palpi, yellow; clypeus gray pruinose, demarked by very deep sutures. Antennae with the scape ochre yellow, flagellum black; terminal segment nearly twice the penultimate; intermediate segments about twice as long as broad. Head dark gray; eyes rather broadly separated

Thorax appearing almost uniformly light ochreous, the ground color very pale gray, the praescutum with three vaguely indicated more buffy or reddened stripes, the scutal lobes similarly patterned; remainder of thorax ochreous, very sparsely pruinose, the dorsal mesopleura more heavily so. Halteres obscure yellow. Legs obscure yellow, the terminal tarsal segments darker; claws relatively small and simple, hairy on proximal half. Wings nearly hyaline, the narrowly elongate stigmal region more yellowed;

veins light brown. Macrotrichia on outer third of R_4 and all of distal section of R_5. Venation: *Rs* about one-half longer than *r-m,* in cases more or less angulated at near midlength; branches of *Rs* diverging gradually, cells R_2 and R_4 at margin subequal.

Abdominal tergites brown, the posterior borders of the segments narrowly pale, sternites yellow; hypopygium dark. Male hypopygium with the outer dististyle widened distally, the inner apical margin conspicuously emarginate. Inner dististyle appearing as a short flattened spatula, the apex obtuse. Gonapophysis broad basally, narrowed on outer half, terminating in a hairlike point. Aedeagus with penis filaments with narrow dusky wings or flanges on proximal third.

Habitat: Utah.

Holotype: ♂, Zion National Park, altitude 4500 feet, June 22, 1942. (C. P. Alexander). *Paratopotypes:* 3 broken ♂♂, June 21–22, 1942.

The present fly is readily told from the other small-sized Nearctic species of the genus by the generally pale color and structure of the male hypopygium, particularly the outer dististyle, gonapophysis, and aedeagus. It it readily told from the various eastern species, as *Blepharocera capitata* (Loew) and *B. similans* Johannsen, by the hypopygial structure, especially the gonapophyses.

Paltostoma parviceps n. sp.

Thorax massive, the head very small; mouthparts very small, maxillary palpi 1-segmented; antennae 15-segmented, the two terminal segments partly fused; thorax black, handsomely patterned with silvery; wings with a weak dusky tinge, the entire membrane densely provided with microtrichia; vein *A* preserved for nearly two-thirds its length.

Female: Length about 6.5 mm.; wing 7.5 mm.; antenna about 1.1 mm.

Head very small as compared with the enlarged thorax, dark colored throughout. Mouthparts very reduced; mandibles lacking; maxillary palpi apparently 1-segmented, excluding the palpiger, larger than in *lobata;* labial palpi projecting only a short distance beyond the pointed labrum. Eyes of moderate size only, widely separated by the vertex, not bisected; all ommatidia equal, with short setae. Antennae dark brown, 15-segmented; pedicel only a little larger than the scape, flagellar segments about one and one-half times as long as broad; outer two flagellar segments partially fused, the smaller outer segment somewhat pointed at tip.

Thorax massive; praescutum with the ground silvery white, with three broad brownish black stripes; posterior sclerites of notum paler brown, more or less silvery pruinose, the scutal lobes margined posteriorly with darker; postnotum very reduced. Pleura brown, pruinose, the most conspicuous areas being a bright silvery transverse area from the lateral end of the mesonotal scutum across the pleura, and a smaller marking on the meral region. Halteres blackened, the base of stem more yellowed. Legs with the coxae and trochanters small, brown, pruinose; remainder of legs brown, the femoral bases more yellowed; posterior tibia with a single long spur; last tarsal segment with a group of strong black bristles on flexor surface near base; claws long and nearly straight, simple, lying parallel and approximated to one another, the claws only a little shorter than the last segment. Wings with a weak dusky tinge, the veins darker. The entire membrane densely provided with microtrichia. Anal lobe of wing very conspicuous. Venation: *Rs* short, less than one-half *r-m;* vein R_4 short, oblique, nearly equal in length to the distance on costa between it and vein R_{1+2}; vein *A* preserved for nearly two-thirds its length.

Abdomen brown, with pruinose areas. Spermathecae three, subglobular to pyriform.

Habitat: Peru (Junin). *Holotype:* ♀, Carpapata, Tarma, altitude 2600 meters, May 1, 1940 (Felix Woytkowski).

Most similar to *Paltostoma lobata* Edwards (Peru, near Lima), differing most evidently in the larger size and in the dense microtrichia over the entire wing surface.

Paltostoma delectata n. sp.

Belongs to the *schineri* group; mesonotum chestnut brown, including four praescutal stripes, the interspaces broadly silvery; no blackened areas on thorax; fore femora chiefly blackened, with an obscure yellow subterminal ring, remaining femora yellow with the tip narrowly brownish black; claws strongly toothed; wings crystal clear, the veins brownish black; microtrichia in apical cells only including R_3 and R_4; a short spur of the Anal vein persists; male hypopygium with the ninth tergite conspicuously emarginate, the lobes broad; outer dististyle exceedingly broad and flattened, inner style slender, only slightly dilated outwardly.

Male: Length, excluding rostrum, about 3.5 mm.; wing 5 mm.; rostrum alone about 1.6 mm.

Rostrum pale brown, the elongate part consisting of the labrum,

hypopharynx and labium; labial palpi short, approximately four times the basal diameter; maxillary palpi short, apparently 1-segmented. Front dull orange, silvery pruinose. Antennae 15-segmented, black, the scape paler; flagellar segments shortsub-cylindrical, the length less than twice the breadth; terminal segment longer than the penultimate. Head chestnut brown, variegated with silvery on the anterior vertex.

Pronotum pale brown, pruinose. Mesonotum chestnut brown, including four broad confluent praescutal stripes, leaving broad silvery areas on the humeri and at the prolongations of the suture; posterior sclerites brown. Pleura obscure yellow, the dorsal sternopleurite and meral region silvery. Halteres with stem yellow, knob blackened. Legs with coxae and trochanters yellow; fore femora chiefly black, more brightened basally and with a very obscure yellow to scarcely evident subterminal yellow ring; remaining femora yellow, the extreme tips brownish black; fore tibiae and tarsi black, the remaining tarsi obscure brownish yellow; posterior tibia with a single long spur; claws with a strong spine beyond base; last tarsal segment with a group of strong black setae at base of flexor surface. Wings crystal clear, the veins brownish black to black, very conspicuous; apical cells of wing, including most of R_3 and outer end of R_4, with microtrichia, the remainder without these. Venation: *Rs* oblique, about one-half *r-m;* petiole of cell R_3 more than twice vein R_4. Anal vein represented by a strong spur that extends to just beyond the axillary thickening.

First abdominal tergite yellow, the remainder brown, their extreme bases paler and more or less pruinose; sternites more extensively yellow, silvery pruinose beneath, the sides infuscated; outer segments, including hypopygium, dark brown. Male hypopygium with the ninth tergite conspicuously emarginate, the lobes broad. Outer dististyle exceedingly broad and flattened, the apex truncated; inner dististyle slender, only slightly dilated outwardly.

Habitat: Costa Rica. *Holotype:* ♂, Rivas, altitude 2875 feet, January 1939 (Dean Rounds). *Paratopotype;* ♂, altitude 2975 feet, January 1939.

The present fly is most similar to *Paltostoma schineri* Williston (Lesser Antilles, Trinidad), differing in the coloration of the thorax and legs. Williston describes the antennae as being only 13-segmented. Edwards (Diptera Patagonia & So. Chile, 2, fasc. 2, Blepharoceridae: 68; 1929) provides further notes on the

types of *schineri,* including both sexes. The early stages and further notes on the female are provided in the outstanding paper by Scott and Lamb (The early stages of *Paltostoma schineri,* Williston. Ann. Mag. Nat. Hist., (8) 15: 181–202, 3 pls.; 1915).

Dynastes Granti Horn in Utah.—I was pleasantly surprised on September 12, 1951, when Dr. D. M. Hammond, Head of the Zoology and Entomology Department of the Utah State Agricultural College, handed me a fine living specimen of this large beetle which was enclosed in a pint glass fruit bottle. The specimen had been collected at Kanab, Utah, on September 5, by Frank Hanson of Providence, Utah. He found the unusual beetle to be crawling up the screen door of his auto court cabin, the morning of September 5. Having become somewhat interested in insects through his entomologist brother, Wilford, he brought the beetle home with him. Because Wilford is and will be in Sweden for nearly another year, the specimen was given to the College. It was identified by Dr. E. A. Chapin as "*Dynastes granti* Horn". Another specimen of this species was present in the College collection. It had been taken by Dr. D. D. Jensen on July 1, 1937, below Flagstaff, Arizona.—G. F. Knowlton, Logan, Utah.

A Lettuce Root Aphid: An injurious population of aphids was found to be infesting lettuce roots in a field east of Murray, Utah. An abundance of wingless and winged specimens from this field, collected October 26, 1950, was received from G. Thorne and Dr. E. M. Anderson. Professor M. A. Palmer recently examined four prepared slides of this material, identifying it as *Pemphigus balsamiferae* Williams or *P. bursarius* (L.) This material appears to be the same as the commonly injurious sugar beet root aphid which causes periodic beet crop injury in Utah. Aphid material considered as *P. balsamiferae* was collected on *Chenopodium album* at Cowiche, Washington, May 21, 1947, by B. J. Landis and E. W. Davis. This aphid also has been collected by the writer on several occasions in northern and central Utah and at Franklin, Idaho, on roots of this weed; and at Powell, Wyoming, on sugar beet roots, April, 20, 1948, by H. Beaudoin. Accidental alates of the beet root aphid has several times been collected on celery in northern Utah, being particularly numerous in fall.— G. F. Knowlton, Logan, Utah.

A NEW NORTH AMERICAN SPECIES OF METOPIA (DIPTERA, SARCOPHAGIDAE)

By Curtis W. Sabrosky, Washington, D. C.

While studying miltogrammine flies collected and reared by Karl V. Krombein in his studies of the biology of sphecoid wasps, it was found that an undescribed species of *Metopia* had hitherto escaped notice, and in fact had been confused with other species. Subsequently, Professor H. J. Reinhard kindly made available for study an excellent series that made possible the recognition of the female. The description of the new form is presented herewith in order that it may be properly distinguished from several related species in the continuing biological studies. This is the first North American species of *Metopia* that has been described since the revision of the Miltogrammini by Allen (1926, Proc. U. S. Nat. Mus. 68, Art. 9: 1–106).

Metopia krombeini n. sp.

Species with sides of abdomen yellow, no median marginal bristles on first abdominal segment, no anterior bristles on tibiae, short stubby palpi, male with broad and silvery frontal vitta, and male fore tarsi with long lateral bristlelike hairs.

Male. Black, gray pollinose, the second anntenal segment reddish apically palp yellowish, abdomen basally yellow, especially on venter and broadly on sides of first and second segments, and trochanters and narrow base of hind femur yellow, the legs otherwise black, sometimes the hind femur also black; front, face and cheek silvery pollinose, the broad frontal vitta conspicuously so up to the vertex except for the narrow V of the ocellar tubercle.

Front at narrowest one third (0.32–0.35) the width of the head, widening slightly from antennae toward the vertex; frontal vitta well over three times the width of a parafrontal opposite lower orbital bristle, densely pollinose and virtually destitute of hairs; front only moderately projecting, in profile projecting only one-fourth the width of an eye; parafacial bristles moderately strong, each parafacial narrowing below to become almost linear as viewed in profile; cheek extremely narrow, in profile less than 1/20 the height of an eye; antenna relatively long, reaching nearly to oral margin, the third segment slightly over four times as long as the second; arista thickened on basal fourth to third; palp represented by short stubby rudiment, as in *M. sinipalpis,* usually obviously much less than width of haustellum, the length slightly variable but rarely approaching the width of haustellum.

Thorax and abdomen in general as described for *M. sinipalpis;* pollen of both mesonotum and abdominal dorsum gray with a decided brassy tinge, and both second and third abdominal segments with a strong lateral bristle on each side. Genitalia near *sinipalpis,* but the inner forceps not broadened and angulate basally, and the outer forceps longer and narrower basally. Wing venation approximately as in *sinipalpis.* Legs not strongly bristled, the middle tibia entirely without bristles on anterior surface; fore tarsus relatively long and slender, as in *sinipalpis,* but with a row of long, bristlelike hairs on the posterolateral surface of the second, third and fourth segments, each segment with four to six hairs evenly distributed along the side, the hairs longest on the second segment and becoming gradually shorter toward the fourth, the longest hairs (on second segment) 1½ times as long as the second segment itself; hairs on fifth segment longer than usual, but not obviously part of the regular row.

Female. As described for male, except as follows: Hind femur regularly yellow on basal fourth to third (males tend to be darker); front and face bright gray pollinose, but without the silvery sheen of the male front; parafrontals broader, the frontal vitta less than three times the width of a parafrontal opposite lower orbital bristle; fore tarsus normal, without long lateral hairs.

Length: 4–6 mm.

Holotype, male, College Station, Texas, June 21, 1928 (H. J. Reinhard), and allotype, same locality and collector, June 24, 1928. Type No. 61674 in the U. S. National Museum. Paratypes (Reinhard Collection and U. S. National Museum): 116 (50 males, 66 females), College Station, Texas, April 21, 22, 28, 29, May 2, 4, 9–11, 14, 15, 18, 26, 27, 29–31, June 1–7, 9–14, 16, 17, 19–22, 24, 25, 27, July 1, 3, 5, 7, 10, and August 10 (two females), in various years 1923–1951 (H. J. Reinhard): 2 males, Milan County, Texas, May 18, 1941 (H. J. Reinhard); male, Rock Creek, D. C., June 12, 1917 (C. H. T. Townsend); female, Chain Bridge, Virginia, July 16, 1923 (J. M. Aldrich); 4 males, Kill Devil Hills, North Carolina, May 24, July 29 (two), and August 5, 1952 (K. V. Krombein), and female, same locality, July 2, 1950 (Krombein).

The absence of bristles on the anterior surface of the mid tibia will separate both sexes of *krombeini, sinipalpis, lateralis* and *lateropili* from the other and strongly bristled species in the genus (*leucocephala, campestris,* etc.).

In the key by Allen (1926, p. 48), *krombeini* will run to *sinipalpis* in couplet 8 on the basis of the palpi and the color of the

abdomen, but has long hairs laterad on the fore tarsus of the male, whereas the male of *sinipalpis* has no such hairs. In both *lateralis* and *lateropili,* which have well-developed palpi, the fore tarsi have long bristlelike hairs, but only one or two per segment and these are apical.

It may be useful to present here a key to those males of *Metopia* with the unusually long hairs on the fore tarsi:

1. First abdominal segment with a pair of strong, erect median marginal bristles; strong anterior bristle on mid tibia
M. campestris (Fallén)
First abdominal segment with median marginal bristles; no bristles on anterior surface of mid tibia .... 2.
2. Distal three segments of fore tarsus short and rounded, with one or two long, bristlelike hairs on upper side at apex of each of segments two to four .... *M. lateralis* (Macq.)
Not so, the distal three tarsal segments slender and longer than broad, the long hairs posterolaterad .... 3.
3. Only one or two long hairs on each of segments two to four, situated at apex of each segment .... *M. lateropili* Allen
Row of long hairs evenly distributed along the posterior side, with four to six on each of segments two to four.
M. krombeini Sabrosky

Except for *campestris,* the females of the above species are difficult to distinguish, and the following key is offered. Although the key takes account of some variation, the color pattern of the legs is actually very consistent, and only a very few individuals were found about which some question might be raised. *Metopia lateropili,* on the basis of limited available material, typically has the abdomen entirely black and would not normally be confused with the other species. However, it may conveniently be included here because it appears to be closely related to the other species, and because in a specimen or two there is a suggestion of yellow area on the sides of the abdomen, and the variation might cause some trouble if not accounted for.

Key to Metopia females with abdomen laterally yellow

1. Palpi slender and black, moderately well-developed, obviously equal to or greater than width of haustellum..........2.
Palpi short, yellowish, usually appearing as a flattened stub barely over twice as long as broad and obviously much less than width of haustellum, rarely almost as long but then yellowish and the legs characteristically with fore and mid

femora entirely black and the hind femur yellow on basal fourth to half .... 3.

2. Abdomen broadly yellow at base, including the sides and entire venter of first two segments; typically all trochanters, basal third to half of hind femur, and sometimes base of mid femur narrowly to one third, yellow to reddish yellow.
M. lateralis (Macq.)

Abdomen typically black, rarely slightly yellowish on sides at base; legs entirely black, including all trochanters.
M. lateropili Allen

3. Legs predominantly black, the fore and mid femora entirely so, the hind femur yellow on basal fourth to third and the trochanters yellow .... *M. krombeini* Sabrosky

Legs with prominent yellow areas, including all trochanters and the basal halves of all femora, sometimes less on fore femur in particular .... *M. sinipalpis* Allen

Metopia sinipalpis Allen

The key and description by Allen appear to need a slight modification, though I do not have all of the original material available for reexamination. However, in the 30-odd specimens at hand, including fifteen (9 males, 6 females) of the type series, the rudimentary palpi can be found in all specimens, though sometimes with difficulty. The rudiments are slightly longer in the females than in the males.

There is regularly considerable yellow on the legs, including usually the basal halves of mid and hind femora in the males and the basal halves of all femora in the females. It appears from the material before me that this leg coloration offers a consistent means of separating the otherwise very similar females of *sinipalpis* and *krombeini*.

Townsend (1935, Revista Ent. 5: 68) erected the genus *Allenanicia* for *M. sinipalpis* because of the lack of median marginals on the first abdominal segment and the absence or rudimentary condition of the palpi. On the basis of those characters the new species is also referable to *Allenanicia,* for those who might wish to recognize it as a distinct genus.

TWO NEW NORTH AMERICAN ISOTOMA (COLLEMBOLA) AND KEY TO EYELESS FORMS

By D. L. Wray, Raleigh, N. C.

Few eyeless species of *Isotoma* have been described and it was of special interest when the following were found in widely separated localities. Schäffer (1896) described a small, white, eyeless species (*Isotoma minor*) which lacked postantennal organs and which was found in the soil and under objects in damp situations. Linnaniemi (1912) described another species (*I. sphagneticola*) which had a postantennal organ but no eyes, and which was found in sphagnum in Finland. Chamberlain (1943) described a species (*I. spatulata*) without eyes but with a postantennal organ, and which occurred in nests of a termite (*Termopsis angusticollis* Hagen) in Oregon. Of the two species described in this paper, one (*I. tariva*) was found in the leaf mould along a river in North Carolina, and the other (*I. brucei*) in a pocket gopher nest, in Utah.

Isotoma tariva n. sp.

Length up to 1.5 mm. White background with a sprinkling of fine round dots of black pigment arranged in small stringy groups over head and body. Eyes absent. Postantennal organs present, broadly elliptical in shape, situated near base of the antennae. Antennae one and a half times longer than head with relative length of segments as 13: 25: 25: 40. Organ of third antennal segment consists of two slightly bent rods lying each behind a fold; 4th ant. segment with several long curved sensory setae and some shorter ones. Unguis short, stout, without inner or outer teeth. Unguiculus broadly lanceolate becoming acute and pointed at apex, without teeth. Tenent hairs absent. Tenaculum quadridentate, with 5 setae on corpus. Last two abdominal segments not ankylosed. Manubrium to dentes as 30: 80. Manubrium and dentes densely covered with short curving setae, especially ventrally. Mucro tridentate, with a small basal tooth, a large median tooth and a large terminal, upcurved falcate tooth. Body clothing consists of numerous short, reclinate setae, and numerous long, curved, fringed setae on last three abdominal segments.

Type locality: Oxford, North Carolina, March 20, 1952, D. L. Wray. This species was taken in large numbers from the forest floor covering along Tar River in the course of a project I am now making in studying the Collembola fauna and populations along the

main river habitats which flow through the State toward the Atlantic drainage. This species was found associated with *I. andrei* Mills, a three-eyed species. Cotypes deposited in the NCDA Insect Survey Collection, Raleigh.

Isotoma brucei n. sp.

Length up to 1.8 mm. Yellowish-white background with traces of black pigment over head and body in the pattern of small grouped areas of punctiform pigment, heavier on head and thorax. A large species. Eyes absent. Postantennal organs situated close to tne antennal base, narrowly elliptical. Antennae longer than head or as 26: 18; proportions of segments as 4: 7: 7: 11. Sense organ of third antennal segment wih 2 slightly bent sense rods lying behind a small integumentary fold. Fourth antennal segment with several sensory setae, but not of unusual shape as compared with *Isotoma minor.* Unguis stout, curved slightly, with a pair of outer teeth, and with a strong tooth on inner margin. Unguiculus broadly lanceolate, acute at apex and with a prominent tooth on inner angle. Tenent hairs absent. Third and fourth abdominal segments about subequal in length, fifth and sixth segments not ankylosed. Tenaculum quadridentate; corpus with about 10 setae, with one larger outstanding one. Manubrium to dens as 10: 20. Mucro quadridentate, ventral surface strongly curved, apical tooth large, anteapical tooth about same size, and with 2 small basal teeth not in line with each other. Venter of dens with many moderately stout hairs.

Type locality: Monte Cristo, Utah, July 20, 1951, J. V. Bruce and G. F. Knowlton. Taken in the nests of pocket gophers. Cotypes in NCDA Insect Survey Collection.

The following key may be helpful in separating the eyeless forms of *Isotoma:*

1. Postantennal organs absent, with large sensory cones on fourth antennal segment, genital and anal segments ankylosed .... minor
   Postantennal organs present, sensory setae of the fourth antennal segment of the usual shape, genital and anal segments usually weakly separated or distinctly demarcated 2
2. Mucro quadridentate; unguis with inner and outer teeth; unguiculus with a strong tooth on inner margin .... *brucei*
   Mucro tridentate; unguis untoothed; unguiculus without teeth 3

3. Unguis with unusually broad lamellae; unguiculus narrow, without lamellae; corpus of tenaculum with several anterior setae . . . . *spatulata*
   Unguis broadly lanceolate, without unusual shaped lamellae; unguiculus broad and terminally pointed 4
4. Corpus of tenaculum with 2 anterior setae . . . . *sphagneticola*
   Corpus of tenaculum with 5 or more setae on anterior *tariva*

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BOOK NOTES

The Wonderful World of Insects, by Albro T. Gaul. vi + 290 pp., 47 full page photographs. 5 × 8 ins., cloth bound. 1953. Rinehart and Co., Inc., New York, N. Y. (Price, $4.00)

This volume presents an extremely well-balanced account of the role of the insects in the living world. Although it is written in non-technical language, both the basic as well as many of the modern aspects of the science of entomology are covered clearly and comprehensively. A series of photographs, all taken by the author, augment the text material in an excellent fashion.

The subject matter is arranged under sixteen chapter headings. Some of the topics discussed are How Insects Grow and Mature, The Living Insect, How Insects Act, Insects Societies and Those Intelligent Insects. Each topic stresses fundamental principles which are ably supported by pertinent examples.—George S. Tulloch, Merrick, New York.

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This page is limited to exchange notices and to small For Sale advertisements from members of the Society and from actual paid subscribers to the Bulletin exclusively. *Exchange notices* from members of the Society and from subscribers are limited to *three (3) lines each,* including address; beyond 3 lines, there will be a charge of $1.00 for each 3 lines or less additional. *For Sale* ads will be charged at $1.25 for each 3 lines or part of 3 lines. *Commercial or business* advertisements will not be carried in this page, but will go in our regular advertising pages at our regular advertising rates to *everybody.*

LEPIDOPTERA AND ORTHOPTERA from Florida in papers and local specimens mounted to exchange for other Lepidoptera. —Alex K. Wyatt, 5842 N. Kirby Avenue, Chicago (30), Ill.

WANTED—Geometrid moths, for cash or exchange. John L. Sperry, 3260 Redwood Drive, Riverside, Calif.

CERAMBYCIDAE AND CHRYSOMELIDAE from Asia and Pacific desired for determination; purchase; exchange.—J. Linsley Gressitt, Pacific Science Board, Bishop Museum, Honolulu, T.H.

WANTED—Psyche, vols. 11, 13, 15; Trans. Amer. Ent. Soc., vols. 1–5. C. F. dos Passos, Mendham, New Jersey.

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Vol. XLVIII JUNE, 1953 No. 2

BULLETIN

OF THE

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PUBLICATION COMMITTEE
JOSEPH C. BEQUAERT
GEORGE S. TULLOCH E. W. TEALE

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CONTENTS

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BULLETIN

OF THE

BROOKLYN ENTOMOLOGICAL SOCIETY

Vol. XLVIII JUNE, 1953 No. 3

BROCHOSOMES.[1]

By G. S. Tulloch & J. E. Shapiro, Brooklyn, New York

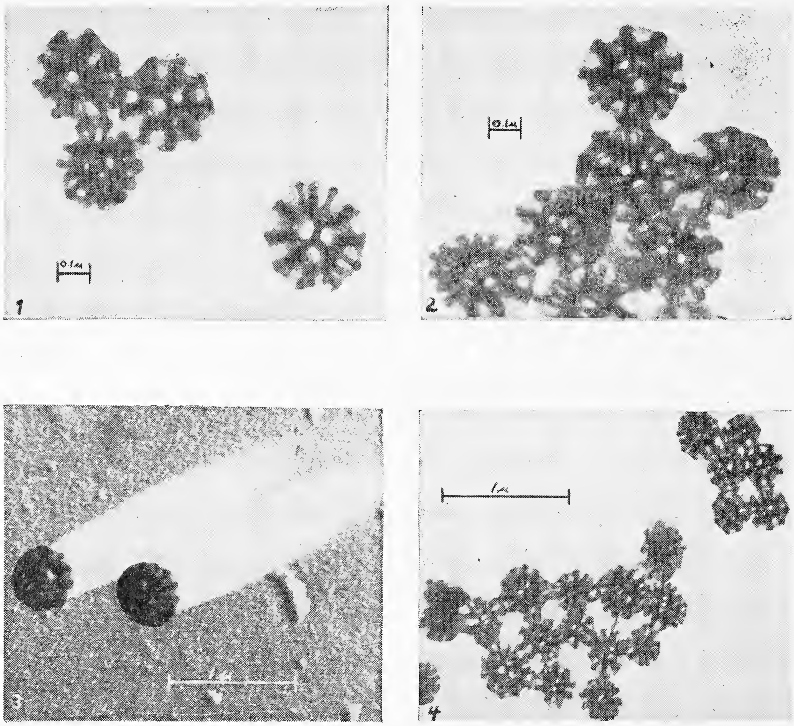
The occurrence of similar ultramicroscopic bodies on certain leafhoppers and mosquitoes from widely separated geographic areas, Utah and Puerto Rico, first was reported in 1952 (Tulloch, Shapiro & Cochran). This paper records additional information concerning their association with insects, both in terms of species and geography, and presents a provisional interpretation of their structure.

These bodies are hollow spheriods which vary in size from 240 to 600 millimicrons in diameter. They occur as aggregates (Figs. 1, 2 & 4) or as isolates (Figs. 1 & 3). Less frequently, stages suggestive of formative phases have been noted (Figs. 5, 6 & 7). The most characteristic feature of the predominant type of body is a fixed arrangement of high and low electron-scattering areas which imparts to it a meshed or netted appearance. It is this constantly recurring pattern which has suggested the term *brochosome* (Gr. βρόχος—mesh of a net, σῶμα—body) for these ultramicroscopic bodies.

Brochosomes are found associated with wings, wing scales, antennal hairs and other cuticular extensions. Many of these structures permit penetration of the electron beam and consequently brochosomal preparations can be made without difficulty. A wing of a mosquito or leafhopper, for example, is placed in a drop of water on a piece of formvar filmed 200 mesh screening and allowed to dry at room temperature. In the drying process the wing is flattened and fixed to the screening and some of the easily dislodged brochosomes from the wing surface are pulled to the per-

[1] This study was supported in part by a research grant from the National Science Foundation.

imeter of the drop of water and there become fixed to the clear film. The orientation of the wing fixed to the screening is ascertained by examination with a light microscope equipped with a disc cutter. Specimen grids made up of about equal parts of wing and clear film are then stamped out for use in the electron microscope. In such preparations it is possible to study brochosomes on

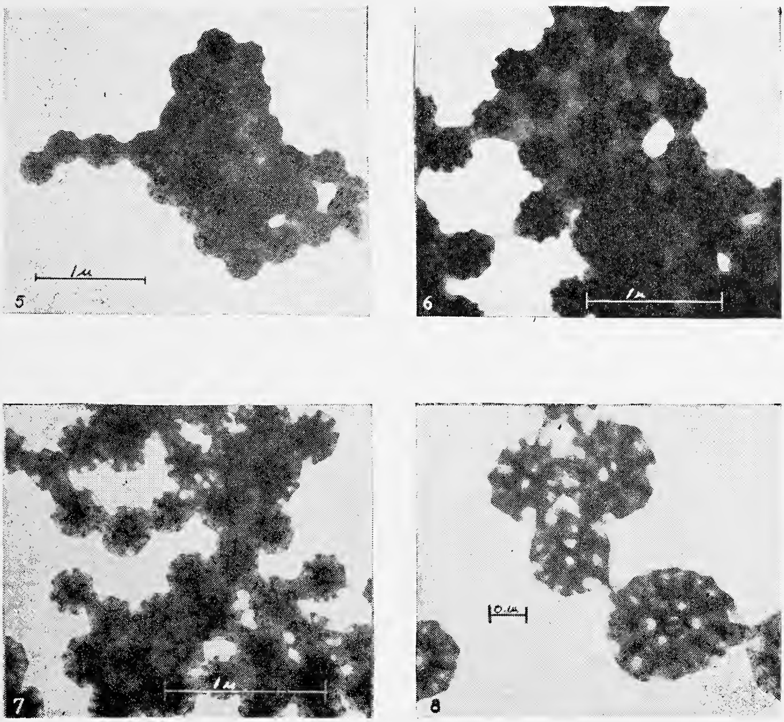


Figs. 1–4. Brochosomes at varying magnifications (indicated by scale line). Aggregates and isolates are shown. Bodies in Figure 3 were shadowed with chromium.

clear film and if the wing permits electron penetration from charted areas on the wing surface. Preparations of antennal hairs and other cuticular structures may be made and studied in essentially the same manner.

In this study fresh specimens collected on Long Island and dried specimens secured from many parts of the world were examined to determine the presence, relative abundance and types of brochosomes. The different types encountered were evaluated in

an effort to determine if variations in size, shape or consistency were due to a natural inconstancy in form or to a developmental sequence. Since brochosomes are easily dislodged from an insect and since a transfer from a normal to an incidental associate might occur during sweeping or beating, the presence of a few isolated bodies was not accepted as indication of a fixed association. In all cases cited herein, the brochosomes occurred in thousands.



Figs. 5–8. Presumptive (5–7) and final (8) stages in the formation of brochosomes.

In the original account dealing with brochosomes (*op. cit.*) their association with two species of leafhoppers and two species of mosquitoes was recorded. Since these observations admittedly were incidental to other studies, a limited brochosomal survey of other species of insects was undertaken. The species examined were represented by fresh speciments secured by sweeping during a period when leafhoppers were the predominant forms present.

A partial but representative list of insects positive for brochosomes follows:

Order	Family	Species
Homoptera	Cercopidae	*Philaronia bilineata*
	Fulgoridae	*Liburnia* sp.
	Cicadellidae	*Idiocerus nervatus*
Hemiptera	Miridae	*Lygus pratensis*
Diptera	Anthomyiidae	*Hylemyia* sp.
Hymenoptera	Tenthredinidae	*Pteronidea* sp..
	Chalcidae	*Harmolita* sp.

Although an environmental or ecological relationship is indicated for all of the species covered in this very limited survey no common phylogenetic connection can be noted.

The discovery of brochosomes in fixed association with insects from the widely separated areas represented by Utah and Puerto Rico is, in itself, suggestive of a rather general geographic distribution. To further substantiate the wide distribution of brochosomes, a limited survey of specimens from other areas was accomplished. In this phase of the study the specimens, for the most part, were obtained in dried form from museum collections and some of them bore dates as far back as 1919. An examination of these specimens resulted in the extension of the geographic range of brochosomes as indicated below.

Locality	Type of insect
Dartmouth, Nova Scotia	Cercopids
Merrick, New York	Fulgorids
	Leafhoppers
	Anthomyids
	Sawflies
	Chalcids
Brooklyn, New York	Mirids
Jacksonville, Florida	Leafhoppers
Cuernavaca, Mexico	Leafhoppers
Huichapa, Mexico	Leafhoppers
Tibet Province, China	Leafhoppers
Bengal, India	Leafhoppers
Lukolela, Africa	Leafhoppers
Boquete, Panama	Leafhoppers

The large number of leafhopper positives is merely a reflection of a subjective sampling procedure necessitated by availability of specimens and not an indication of an exclusive cicadellid association.

In the examination of brochosomes from a variety of insects and from a fair sampling of the geographic areas of the world, the type most consistently encountered is that showing the typical network and a hollow central area (Figs. 1–4 & 8). Types suggestive of formative or developmental stages have been noted occasionally (Figs. 5, 6 & 7) both from fresh and dried material. In the study of thousands of electron microscope fields involving hundreds of positive specimens, brochosomal types illustrated in Figures 5 and 6 have been observed four or five times while those shown in Figure 7 have been noted somewhat more frequently.

The material shown in Figure 5 appears to be a cohesive mass of units of high electron density in each of which there is an indication of the beginning framework of the individual brochosomes. The further separation of the mass into definite units is visible in Figure 6. The brochosomes essentially free of the homogeneous enveloping material noted earlier but still retaining a central area of high electron scattering material are represented in Figure 7. The final stage and the one most frequently noted, that showing the typical network and hollow central area, is illustrated by many of the figures (Figs. 1, 2, 3 & 8).

Despite the spheroidal nature which should facilitate interpretation, the small size of the brochosome is responsible for difficulty in ascertaining the structural arrangement of the areas of high and low detail. Shadow casts are useful only in verifying the spherical shape (Fig. 3). Stereographs yield little information beyond that obtained by shadow casts.

The failure of the conventional methods of visualization to provide a complete understanding of the structural nature of the brochosome necessitated an indirect approach, that of utilizing a fabricated series of models. A study of the model (Fig. 9) whose shadows most closely approximated the electron micrographs of the predominant type of brochosome (Figs. 1, 2 & 3) has been used as a basis for the provisional description which follows.

A brochosome is a biradially symmetrical structure whose shape is that of a sphere which is slightly flattened at one pole. The central portion of the body is hollow and communicates with the outside through a polar opening. Except for a meridonal pattern

of areas of high-electron density, the surface is made up of a delicate membrane permitting easy penetration of electrons. The asymmetrical arrangement of the meridonal thickenings in the polar areas distorts an otherwise perfect spherical symmetry of the brochosome. The proximal hemisphere (arbitrary designation) is characterized by a latitudinal fusion of the meridonal areas

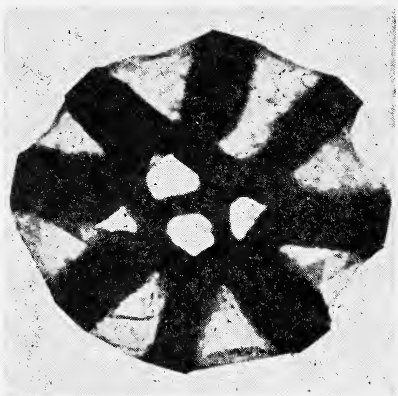


Fig. 9. Photograph of a brochosomal model.

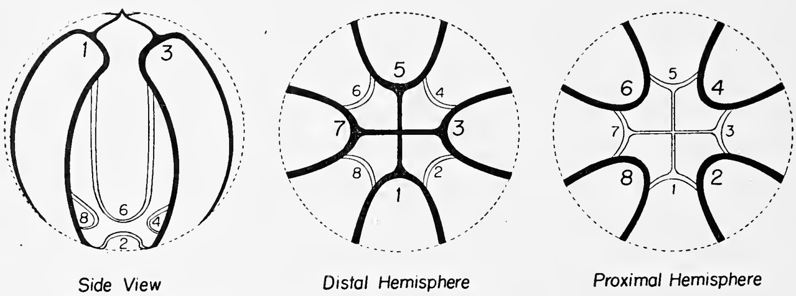


Fig. 10. Diagrammatic representation of a brochosome viewed from indicated aspects. Similar areas are indicated by identical numbers.

into paired loops which are apposed pressure-wise to give the appearance of a circle surrounding the proximal opening. In the distal hemisphere each pair of thickenings join together to form a single strand which extends and connects with a similar strand from the opposite pair at the distal pole. In brochosomes with

four pairs of thickenings the distal pole is characterized by a cross-like pattern. A diagrammatic representation of these areas of high electron density is given in Figure 10.

The information which has been presented concerning the occurrence of brochosomes with many different types of insects and from widely separated, climatically distinctive geographic areas is a clear indication that a more general associative phenomenon exists than was reported in the original work (*op. cit.*). Evidence concerning the origin of brochosomes is less definite. It is conceivable that they are formed from secretory derivative of epidermal cells which pass through the pore canals onto the surface of the body during the formation of the integument. On the basis of such a supposition, one might conclude that the types shown in Figures 5, 6 & 7 represent the developmental forms of a sequence from reasonably homogeneous globules to delicately walled brochosomes. Such an hypothesis in which brochosomal formation is synchronized with integument formation would explain the relative infrequency of presumptive developmental stages herein reported.

Appreciation is expressed to Professor D. M. DeLong of Ohio State University and Mr. John Pallister of the American Museum of Natural History for their kindness in providing study material, to Professor Napthali Lewis of the Department of Classical Languages of Brooklyn College for his helpfulness in the formulation of the term *brochosome* and to Mr. Donald Brown for research assistance.

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Tulloch, G. S., Shapiro, J. E. & Cochran, G. W. 1952. The occurrence of ultramicroscopic bodies with leafhoppers and mosquitoes. Bull. Brooklyn Ent. Soc., vol. XLVII, no. 2, pp. 41–42.

See page 84 for special announcement.

AN UNDESCRIBED SALDID FROM THE GULF STATES (HEMIPTERA: SALDIDAE).

By C. J. Drake, Ames, Iowa and H. C. Chapman, Orlando, Florida

The genus *Micracanthia* was erected by Reuter in 1912 for the reception of *M. marginalis* (Fallen) and *M. fennica* (Reuter) of Europe and *M. humilis* (Say) of America, *M. marginalis* being designated as the type of the genus. Since then only one more species has been described from the old world, *M. imitator* Linnavouri of Germany.

In the new world the genus *Micracanthia* is represented by seven native species: *M. humilis* (Say), *M. pumpila* Blatchley, *M. quadrimaculata* (Champion), *M. utahensis* Drake and Hottes, *M. hungerfordi* Hodgden, *M. husseyi* Drake and Chapman and *M. floridana* n. sp. The two older European species, *M. fennica* and *M. marginalis*, are also known to occur in the Americas.

Micracanthia floridana n. sp.

Moderately large, obovate, black with pale markings on hemelytra; pubescence grayish black, largely golden on hemelytra. Hemelytra with two large yellowish white spots on outer margins (one a little before the middle and other subapical), a rounded spot near apex of clavus, two in inner corium (one near the base and other a little beyond the middle), and three near outer margin of darkened area of outer corium (apical one somewhat crescent-shaped) whitish or yellowish white, which are sometimes also tinged with bluish; corium and clavus frequently with bluish areas.

Length, 3.00–3.30 mm. (male) and 3.40–3.75 mm. (female); width, 1.45 mm. (male) and 1.75 mm. (female).

Eyes large, brownish, each deeply notched on the inside a little before the base. Head black, the surface a little granular in appearance, a yellowish spot on each side between ocellus and eye; front with a few scattered long hairs as in other species of the genus, with a small rounded callosity on each side just in front of an eye, the apical part a little raised, darkened but without prominent transverse callosities, clypeus convex, dark ferrugineous. Antennae moderately long, shortly pilose, dark fuscous, the basal segment paler beneath; length of segments I, 18; II, 30; III, 24; IV, 27.

Pronotum narrowed anteriorly, feebly shining, with exterior margin nearly straight (feebly rounded on hind part), the posterior margin deeply broadly excavated, callus moderately raised, not

extended laterally on explanate margins, with a moderately large deep impression on disc; hind lobe not as long as callus. Scutellum transversely impressed near the middle, the hind lobe feebly convex, finely transversely rugulose.

Legs largely black; coxae and trochanters pale testaceous; anterior femora deep black with base and apex testaceous; tibiae brown or dark brown, usually with a subbasal and subapical band testaceous. Intermediate and hind femora whitish testaceous with a very wide black band beyond the middle, the apices narrowly yellowish white. Abdomen beneath black, slightly shining. Last ventral of female margined behind with testaceous. Male parameres as in figure 1. Hemelytra with median vein (near the base beneath) suddenly enlarged and there deeply widely obliquely notched for the

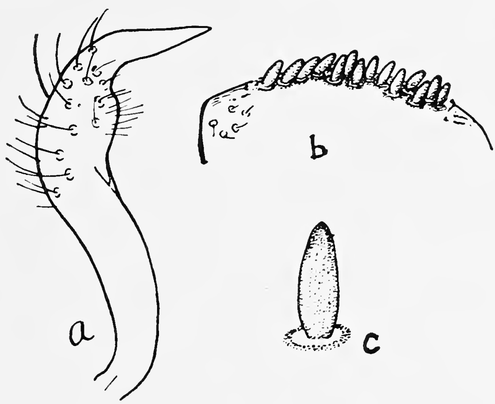

Fig. 1. *Micracanthia floridana:* a, left male paramere 2, anterior end of second connexival segment (one on each side) showing stridulatory pegs in male; c, stridulatory peg greatly enlarged.

reception of the lateral finger-like projection of metanotum (one on each side). These structures working together serve as wing stablizers when the wings are in repose, and are present in both sexes. Male with peg-like stridulatory structure on the upper front margin (one on each side) of the second connexival segment as may be seen in figure 1.

Type (male) and *allotype* (female) Gainesville, Fla., June 9, 1918, (C. J. D.) in Drake Collection. Many *paratypes*—Flordia: Gainesville, taken with type, also by T. C. Hubbell, May 15, 1929; numerous specimens, Apopka (Wekiwa Springs), May–July, 1952, all by H. C. Chapman. Mississippi: Vicksburg, July 1921, C. J.

Drake. Colorado: Fort Collins, May 31, 1898, E. D. Ball. *Paratypes* in collections of U. S. National Museum, Museum of Zoology, Univ. of Michigan and both authors.

This species is most closely allied to *M. quadrimaculata* (Champion), but differs from it by the general shape of the body, larger size (especially females) and longer antennae. *M. quadrimaculata* is smaller and distinctly ovate in outline. Both species are very distinct and not readily confused with *M. humilis* (Say), *M. pumpila* Blatchley or *M. husseyi* Drake and Chapman.

Change of Specific Name of Isotoma.—Since my paper on, "Two New North American Isotoma (Collembola) and Key to Eyeless Forms", appeared in the Bull. Brooklyn Ent. Soc., vol. XLVIII, no. 2, 1953, pp. 54–56, it has come to my attention that the specific name *Brucei* has already been used for an *Isotoma* by G. H. Carpenter, in 1906. He used that name for a new species which was taken in the Antarctic, on Laurie Island, South Orkneys, and evidently honored one, W. S. Bruce who worked on a survey of that region (Proc. Royal Soc. Edinburgh, Session 1905–1906, vol. XXVI, part VI, pp. 474–475). On the other hand, I, unbeknowing, named my new species after J. V. Bruce, who has done much Collembola collecting in the Utah region. I, therefore, change the name of this species from *I. brucei* to *I. brucealla.* Both species are very different, his has six eyes on each side of head, whereas, this one is eyeless.—D. L. Wray, Raleigh, N. C.

BOOK NOTES

The Ants of California, by Thomas W. Cook. xv + 462 pp., numerous textfigures. 6 × 9 ins., cloth bound. 1953. Pacific Books, Palo Alto, Cal. (Price, $10.00)

This book includes a survey of all of the species of ants found within the state as well as information on their distribution, habits and habitats, taxonomic status and economic importance. A particularly desirable feature is the inclusion of a wide variety of literature sources over and above the usual taxonomic references. —George S. Tulloch, Merrick, New York.

A NEW LABEL FOR MICROSCOPE SLIDES.

Raymond E. Ryckman and Barbara A. Deem, Loma Linda, Cal.

Kum-Kleen is a commercial name identifying a pressure sensitive adhesive label, made of sixty-pound stock and litho-coated for printing.

These labels have been widely used in industry and merchandising. Their acceptance has been due to the following qualities: (1) The labels are attached readily to most surfaces without previously being moistened. (2) They remain securely attached for an indefinite period of time under diverse conditions. (3) As the name would imply, these labels, when stuck to a surface are readily "peeled" off without leaving unsightly patches of paper and adhesive. (4) The litho-coated surface is ideal for printing with small point type; ink does not blot or spread into the grain of the paper.

During 1952 the authors were confronted with the problem of mounting a large series of fleas. To include all essential data, it was necessary to print a minimum of twenty words per label. Printing each label with ink and quill pen was a laborious undertaking. Tests were conducted and it was found that the necessary data could be printed on Kum-Kleen labels using a hand press and four-point type.

An order was placed with the Avery Adhesive Label Corporation, Monrovia, California for labels for the exact size needed for microscope slides. The printing operation was speeded by obtaining the labels on paper strips made up in rolls. These strips, with labels attached, were rapidly fed through the hand press.

Experiments were conducted to determine the reaction of labels to variations in temperature. Labels mounted on glass slides were exposed to the following conditions: slides were rotated daily from $-17°$ C. to 22° C. for one week followed by three months at $-17°$ C. and three months at 22° C. Another group of slides at laboratory temperatures were exposed twice for one-day periods of $-17°$ C. and 22° C. followed by three months at laboratory temperatures.

Labels subjected to conditions as above mentioned did not curl at the edges, blister or otherwise become damaged.

A significant feature of these slides is that without wetting, they are readily removed from glass slides leaving no residue of gum or paper. However, Kum-Kleen labels, if wet by water are loosened; upon drying, they again become firmly attached.

As a result of research on this problem, two additional laboratories known to the authors have used Kum-Kleen labels on glass slides with satisfaction. One worker describing a new species used this label for the type specimen.

The Geometric Larva of Lytrosis unitaria.—The larva of *L. unitaria* seems to be unknown sofar (Lepidoptera of N. Y., W. J. M. Forbes, p. 78. 1948). The reason for this is easy to understand as the larva starts hibernating in July and is only single brooded.

I obtained eggs of *L. unitaria* in June, 1951. The larvae stopped feeding in the middle of July and rested in geometric fashion resembling a twig. In this manner they started their hibernation until spring, 1952. The food plant was renewed every two weeks nevertheless and only at this time the larvae nibbled for a short time. Of the larvae I succeeded in keeping alive through the winter, I inflated a full grown larva on May 14, 1952.

The larva feeds on pin oak. The eggs when first laid are green and turn red brown later on. Their shape is oval, are smooth and laid singly.

The color of the full grown larva is brownish gray, approximately the color of the imago. The head is light gray, rounded and has a black median dot on the clypeus. The larva is tapering toward the head. There is a brown dorsal hump on the first abdominal segment. On the fifth segment there is a pair of sharp pointed dorsal tubercles crossways. The same sharp pointed tubercles of the same size are found behind the anal prop-legs. These tubercles stick out horizontally when the larva is at rest. On the suture of the prothorax and mesothorax there is a black median triangular dash. Anterior to the hump of the first segment there are two minute dorsal tubercles. On the second abdominal segment are four more dorsal black tubercles with two more lateral tubercles next to the first two. The same minute tubercles are on the third, fourth, sixth, seventh and eighth segments. On the fourth and fifth segments there is a black lateral line. From the seventh segment to the suranal plate there are some dorsal yellowish ill-defined spots. On the underside of the larva are four black minute tubercles on the third, fourth and fifth segments.

The hibernating larva is 25 mm. long and light brown. The underside is light gray. The head is brown. The sharp pointed dorsal tubercles on the fifth segment and behind the anal prop-

legs are also present. Also present are black lateral lines on the fourth and fifth segments.—JOSEPH MULLER, Short Hills, N. J.

BOOK NOTES

Insect Physiology, edited by Kenneth D. Roeder. xiv + 1100 pp., 257 textfigures. 6 × 9 ins., cloth bound. 1953. John Wiley & Sons, Inc., New York, N. Y. (Price, $15.00)

The stated objective of this book is "to summarize and evaluate the major trends in experimental research on insects." Since this task would be almost too much for any one writer to attempt in the light of the great activity in this field during the past 10 years, 15 investigators have shared in the preparation of the text material.

The topics covered, the number of chapters devoted to each and the names of the contributors are given in the following condensed table of contents.

Integument (3)	A. G. Richards
Respiratory Mechanisms (2)	G. A. Edwards
Properties of Blood (1)	John B. Buck
Internal Environment (1)	John B. Buck
Circulatory Elements (1)	S. C. Munson
Circulation (1)	R. L. Beard
Alimentary System (4)	M. F. Day & D. F. Waterhouse
Nutrition (1)	W. Trager
Excretion (1)	R. L. Patton
Biochemistry of Muscle (2)	D. Gilmour
Nervous System (2)	K. D. Roeder
Receptors (2)	V. G. Dethier
Insect Flight (3)	L. E. Chadwick
Insect Behavior (3) & Social Patterns (1)	T. C. Schneirla
Development (2), Regeneration (1) & Metamorphosis (1)	D. Bodenstein

Approximately 100 pages are devoted to a bibliography and 60 to an index.

Admittedly there are many topics which are not covered, two of these which are specified in the preface are the physiology of light production and of the reproductive system. However, the inclusion of many new topics such as 'insecticides and metabolism' and 'inhibitors of respiratory enzymes' serve to compensate for these admitted omissions.—GEORGE S. TULLOCH, Merrick, New York.

SCHINIA JAGUARINA—ITS FOOD PLANT (LEPIDOPTERA, PHALAENIDAE).

By ALEX K. WYATT, Chicago, Illinois.

In June 1951, my friend, Murray O. Glenn of Magnolia, Illinois, wrote me that on June 14, he had encountered a number of *Schinia jaguarina* flying on a high gravelly bluff. At my suggestion, he looked for and found what he thought to be larvae of the *Schinia* feeding on blossoms and seeds of *Psoralea tenuifolia*. These he sent me on July 24. I could hardly believe that they could be larvae of a *Schinia*, as they had a very small head. All *Schinia* larvae familiar to me have quite large heads. However, one larva pupated and the pupa resembled those of other *Schinia*.

The final proof came when a fine specimen of *jaguarina* emerged on April 25, 1952. Thus another *Schinia* problem was solved, at least partially, for elsewhere the moth may have a different food plant, perhaps of the same genus.

Additional larvae were received in July 1952. These pupated by July 20 and three specimens emerged on August 7th, 14th and 18th respectively. Other pupae hibernated, indicating that in this area there is likely to be a partial second brood, and in more favorable southern latitudes, probably a full second brood. This would be borne out of the fact that in Georgia the species has been taken on May 6 and possibly earlier. The April emergence in the breeding cage was, of course, unnatural.

A superficial description of the mature larvae, from alcoholic specimens, follows:

General color, yellowish green; head pale yellow. Each segment behind the head marked with a heavy black spot at the spiracles and a lighter spot on each side subdorsally.

Length overall 1.35 inches; of head .05 inches.

Width of head .075 inches; of 1st segment .15 inches.

Spider Captures Honey Bee: While visiting the Boyce Thompson Arboretum, near Superior, Arizona, on October 23, 1950, William P. Nye called my attention to a spider which was resting on a red eucalyptus blossom, feeding on a freshly killed worker honey bee. Dr. Willis J. Gertsch identified this spider as a female of *Misumenops celer* Hentz. "It is a crab spider and typical of a group which sits in flowers to capture visiting flying insects" Dr. Gertsch commented.—G. F. KNOWLTON, Logan, Utah.

THE TYPE SPECIES OF SOME GENERA OF EPHEMEROPTERA.

By George F. Edmunds, Jr., Salt Lake City, Utah.

Because Reverend A. E. Eaton's *A monograph on the Ephemeridae* (Trans. Ent. Soc. London, 1871: 1–158, pls. 1–6) was shortly succeeded (1883–88) by his monumental *A revisional monograph of recent Ephemeridae or mayflies* (Trans. Linn. Soc. London, Sec. Ser. Zool., 3: 1–352, pls. 1–65), the earlier work is seldom consulted by the present generation of entomologists. The fact that Eaton designated genotypes and followed sound taxonomic procedures in working this order has minimized subsequent nomenclatural problems. In perusing Eaton's earlier monograph (*op. cit.* :12) I therefore was surprised to note the following statement concerning a paper by Hagen (Stett. Ent. Zeit., 10: 386; 1849): "In the critique of Pict. Ephem. (1843–5), Dr. Hagen indicated in this paper a genus *Potamanthus,* restricted (type *P. gibbus,* Pict.); but he did not adopt the genus in his later writings. Mr. Walsh afterwards described this genus, with additional species, under the name *Ephemerella.* I have passed by Dr. Hagen's usage, and have adopted the latter name for the genus."

If it be true that *gibbus* was the species first designated as the genotype of *Potamanthus,* then, because *gibbus* is now included in *Ephemerella,* the present group of mayflies designated as *Ephemerella* (and hence the family Ephemerellidae) would properly be called *Potamanthus* (and Potamanthidae). The mayfly genus now designated as *Potamanthus* (and the family Potamanthidae) would thus need a new name, there being no available synonym of *Potamanthus.* Reference to F. J. Pictet's *Historie Naturelle General et Particulariere de Insectes Neuropteres, Famille de Ephemerides* (Genf., Paris, pp. 1–300, pls. 1–9) confirmed the fact that *gibbus* was included in *Potamanthus* at the time the genus was erected and is therefore *available* as the type of the genus. After discussing most of the species assigned to *Potamanthus* by Pictet, Hagen (*loc. cit.*) remarks "Der rest erythrophthalmus Schrank, P. gibbus und P. aeneus, beide neu, bilden ein besondern Typus." This is apparently what Eaton has interpreted as a genotype designation.

There are to me at least two reasons why this cannot be considered as a valid genotype designation: first, it is by no means clear that Hagen intended the statement in this sense; and secondly, he has indicated three names rather than one. It should be

noted, however, that all three names are synonyms of *Ephemerella ignita* Poda. Thus some might argue that a single *species* was indicated; but as the synonymy of these names is subjective, the three names cannot be considered as one, and the designation cannot be valid. As far as I am aware the first valid designation of the genotype of *Potamanthus* is that given by Eaton (1871: 36) wherein *P. luteus* Linn. is given as the type. In this same article (p. 31) the genotype of *Ephemerella* is designated as *E. invaria* Walker. As this species was not included in the genus originally, the later designation given by Eaton (1884: 126) is the valid one and the type is *E. excrucians* Walsh.

The nomenclature of the genera and families involved in this investigation thus remains unchanged, but this note is published with the hope that it may save some other worker a few anxious hours of bibliographic search as he seeks the facts pertaining to Eaton's statement.

In his 1871 monograph Eaton named the genus *Isonychia* and designated the type as *I. manca* Eaton (p. 33) (considered by McDunnough and Spieth to be *I. sicca manca*). Under the impression that *Isonychia* was a homonym of *Isonychus* Mannerheim, Eaton (Ent. Mon. Mag., 18: 21; 1881) proposed the name *Chirotonetes* to replace *Isonychia* and in 1885 (p. 204) designated the type as *ignotus* Walker. McDunnough (Canad. Ent., 55: 47, 1923) restored *Isonychia* as the valid name of the genus, but he indicated the type as *Isonychia ignota,* while in reality *Isonychia manca* must remain as type by original designation.

BOOK NOTES

Methods and Principles of Systematic Zoology, by Ernst Mayr, E. Gorton Linsley and Robert L. Usinger. ix + 328 pp., 45 textfigures, 14 tables. 6 × 9 ins., cloth bound. 1953. McGraw-Hill Book Company, Inc., New York, N. Y. (Price, $6.00)

In this advanced text and reference work the authors have given a clear presentation of the principles and methods of systematic zoology both in relation to practical aspects and to evolutionary considerations. There long has been need for a book of this type and its appearance fills an important place in scientific literature. One only can wonder how much confusion in systematic zoology would have been avoided if this text had appeared fifty years earlier. The amount of literature space devoted to the unsnarling of taxonomic matters may have been one of the compelling forces

which prompted the authors to assume the responsibility of preparing such a complete and authoritative text.

The text material is divided into three main sections dealing with (1) Taxonomic Categories and Concepts, (2) Taxonomic Procedure and (3) Zoological Nomenclature. The first section deals with the historical matters and with a discussion of species and other categories. The second considers collecting, identification, quantitative methods of analysis and presentation of findings. The third section discusses among other topics the principle of priority, the type method and ethics in taxonomy. The book is written in a simple straightforward manner with a minimum of complicated scientific terms.

Although directed to the general area of systematic zoology, this book contains a large amount of information of interest to workers in other phases of biology. The chapter on the preparation of taxonomic papers could with a minimum of transfer apply to any scientific paper. In a similar fashion the material in the chapter dealing with quantitative methods of analysis could apply to many aspects of biological study. Still another example of the versatility of this volume is the splendid discussion of the species concept.

This book should serve as a guide for graduate students, teachers, research workers as well as to the vast number of non-professional zoologists and entomologists who make such an important contribution to the science of taxonomy.—George S. Tulloch, Merrick, New York.

Fleas on Flying Squirrel and Barn Swallow: A series of fleas was collected on a flying squirrel, *Glaucomys sabrinus,* taken in Logan Canyon, Utah, April 30, 1952 by Donald E. Lewis. This is an unusual host record for Utah. The fleas proved to be *Opisodasys pseudarctomys* (Baker) and *Orchopeas caedens* (Jordan). Another interesting flea record was that of *Ceratophyllus garei* Roths., collected from nests of the barn swallow, *Hirundo erythrogaster,* by T. Tibbets and L. Dale Haws at Smithfield, Utah, June 7, 1951 (Det. V. J. Tipton).—E. A. Cross and G. F. Knowlton, Logan, Utah.

STREPSIPTERA AND LEAFHOPPERS.

By Henry E. Gray,[1] Urbana, Illinois.

The parasitism of insects by Strepsiptera, the twisted-winged insects, has long been a fact of general knowledge among workers in entomology. However, only a few records exist which note the degree of parasitism by the Strepsipterans and most of these are confined to the Strepsiptera attacking Hymenoptera.

Bohart (1941) published a taxonomic revision of the Strepsiptera of North America. Later (1943) the same worker published a synopsis of the genus *Halictophagus* which normally parasitizes leafhoppers, fulgorids, and treehoppers. A key to the North American species of this genus is included in the latter publication.

During the summer of 1952 a large number of leafhoppers was collected from an ecology study plot located on the University of Illinois campus. The plot had been unmowed for several seasons; consequently there was plenty of protection for the overwintering leafhoppers. Several kinds of plants were present on the plot, but quackgrass, *Agropyron,* was the most prevalent. The leafhoppers were feeding on this grass and the collections were made by sweeping with a 12 inch net.

Three species of leafhoppers, *Parabolocratus major* Osborn,[2] *Draeculacephala antica* (Walker),[3] and *Paraphlesius irroratus* (Say),[4] were the ones most commonly collected. Only one species, *Draeculacephala antica* was found to be parasitized by the Strepsipterans.

In early August only a few specimens of *D. antica* were taken in the collections and none of these were noted to be parasitized. The writer was absent from the campus during the last two weeks of August and no collections were made at that time. By early September *D. antica* was the most predominant of any of the species of leafhoppers present. The specimens of *D. antica* collected in early September were heavily parasitized by a Strepsipteran which was later identified as *Halictophagus acutus* R. Bohart.[5]

On September 10 and 11 a total of 122 specimens of *D. antica* was collected and of these 105 specimens, 86.0%, were found to

[1] Contribution from the Entomological Laboratories of the University of Illinois.

[2, 3, 4] Determined by Dr. Milton Sanderson, Illinois State Natural History Survey, Urbana, Illinois.

[5] Determined by Dr. R. M. Bohart, University of California, Davis, California.

be parasitized. Some of the leafhoppers had as many as 3 to 5 parasites per individual. All of the parasites found were females, the males had emerged prior to the time of collection. The male pupal cases were still present on the leafhoppers. It was also of interest to note that the female parasites were located on the ventral side of the abdomen, whereas, the male parasites were located on the dorsal side. Both sexes of the leafhoppers were parasitized and often both sexes of the parasite were found upon the same leafhopper.

The numbers of specimens of *D. antica* in the collections dropped off very sharply after Mid-September. By September 25 only a few specimens could be found and seldom was one of those collected found to be parasitized.

The effects of the parasites upon the leafhoppers is unknown. Neither is it understood why the parasites were so host specific. The leafhoppers appeared to be normal in every respect and apparently their activities were not inhibited.

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Pierce, W. D 1918. The comparative morphology of the order Strepsiptera together with records and descriptions of insects. Proc. U.S. Nat. Mus., 54: 391–501. 15 pl.

Salt, George. 1927. Notes on the Strepsiptera and their Hymenopterous hosts. Psyche, 34: 182–192.

Wanted: Brief notes from 4 to 30 lines to fill such spaces as this.

STUDIES ON THE PLECOPTERA OF NORTH AMERICA: VI. FURTHER NOTES ON ISOGENOIDES.

By J. F. Hanson, Amherst, Mass.[1]

The publication of this article has been made necessary by a series of peculiar circumstances. At the time of appearance of Dr. Frison's designation of the new species *Isogenoides dorata* (1942) another paper (Hanson, 1943) describing the same species was in press. The latter paper was therefore recalled and modified in order to avoid a synonymy under *I. dorata* Frison. While studying for a short period at the Illinois Natural History Museum in 1946 I discovered that this action created rather than avoided synonymy because Frison's very excellent description, supposedly of *I. dorata,* does not apply to the holotype specimen of the species (i.e., two species were included in the type series of *I. dorata*). Therefore, *I. dorata,* though named, has remained undescribed, except in the immature stage, until recently. And the adult specimens described under *I. dorata* have been unnamed.

For several years I have had a nearly completed manuscript concerning this confusing situation buried on my desk. The original intention was to name the new species after Dr. Frison whose death brought to an untimely close a very active and extremely valuable entomological career. Ricker, however, has recently (1952) named the species *hansoni!* (He was unaware of my studies of the same problem.) My original notes on both species concerned, with only slight modifications necessitated by Ricker's 1952 publication, are included below. This action seemed advisable since Ricker's description and drawings of the previously undescribed *Isogenoides dorata* Frison are hardly adequate for identification of the species.

Isogenoides dorata (Frison)
(Figs. 1–6)

1942. *Hydroperla dorata* Frison, ♂♀ and naiad, Bul. Ill. Nat. Hist. Survey 22(2): 295–296, fig. 67 (in part; naiad descr. and fig., ♂ holo- and ♂ paratopotype specimens apply to this species).

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[1] Contribution from the Department of Entomology, Univ. of Mass., Amherst, Mass.; financially supported by a John Simon Guggenheim Memorial Foundation Fellowship.

1952. *Isogenus* (*Isogenoides*) *doratus,* Ricker, ♂♀, Ind. Univ. Publ. Sci. Ser. 18: 108–109, figs. 56–59.

As mentioned in the introduction, through a confusion in original type designation and because of certain dsicrepancies in Ricker's recent description further comment on this species seems in order. Ricker gave no written description of the species at all and his drawings are either very inaccurate or were made from some species other than *I. dorata.* On the same plate he shows two supraanal process drawings which are different from each other and quite different from the holotype and paratype of *I. dorata.* His ventral view of the male abdomen shows a fingernail-like process on the fifth, sixth, and seventh sternites. The male types of *I. dorata* show such a process on the seventh sternite only. In recently collected and well preserved specimens there may possibly be a colorational indication of a "nail" on the sixth sternite, but the number of "nails" shown by Ricker are, if they exist, unique for the genus.

The following description and figures are based on the paratopotype which was carefully compared with the holotype by the author while in Illinois in 1946. The reasons for placing *dorata* in *Isogenoides* rather than in *Hydroperla* are the same as those discussed for *hansoni* (then called *dorata*) by the author in 1943.

Coloration and structural details of *I. dorata* are typical of *Isogenoides* (see Hanson, 1943). *I. dorata* differs from other species of *Isogenoides* particularly in characters of the supraanal process, lateral stylets, and genital lobes. It appears also to differ from most species of *Isogenoides* in the possession of a distinct "nail" on the seventh abdominal sternite. Usually however, for taxonomic purposes in *Isogenoides,* the presence or absence of a "nail" is of very dubious diagnostic value since in some species it is mostly or completely colorational rather than structural in definition. Detection of the "nail" therefore, depends largely on the state of preservation of colors in the specimens being studies. A very careful study has revealed its presence in some species of *Isogenoides* in which it had not previously been reported (including *I. zionensis,* in which this writer has previously definitely reported its absence). Obviously then, fresh specimens of each species, unbleached by alcohol, must be studied before the absence of this structure can be established for doubtful species.

The species of *Isogenoides* are so closely related one to another that it is difficult to decide on the affinities of *I. dorata.* Its closest relative is perhaps *I. elongatus.* The two species are very similar in shape of genital lobes, general plan of supraanal process, and

even as to position and extent of the membranous area of the subanal lobes. *I. dorata* differs from *I. elongatus* in several details including the more nearly cylindrical shape of its stylets, the markedly less conspicuous size of the subapical spurs on its supraanal process, the greater length of the spine-like setae of the genital lobes, and in numerous details of the aedeagus. (Aedeagal structures of this and related species will be treated in a later paper.)

Male:—length of body, 15 mm.; wings, 13 mm., extending beyond the tip of abdomen.

Dorsolateral humps on abdominal segments six and seven present but rather small and inconspicuous. A conspicuous "nail" present on the seventh sternite; a slight colorational indication of one present on segment six. Ninth abdominal sternite normally (i.e. slightly) produced backward. Genital lobes (10th abdominal segment) large, broadly rounded at apex, and with a patch of about ten relatively elongate (unequalled in length except in *I. hansoni*) spine-like setae in an anterior subapical position. Supraanal process elongate, slightly curved forward; with a tiny, blunt, posteriorly recurved, apical process. Supraanal process membranous except for anterior and posterior sclerotized supports and a small lightly sclerotized cap on the apical hook. Posterior sclerotized support long and almost parallel-sided except near tip which is pointed; not extending quite to apex of supraanal process. Anterior sclerotized support branched near its base into three arms which extend about two-thirds of the distance from base to apex of the supraanal process. The outer two of the three arms broaden toward their apices which are hooked; the median arm narrows toward its pointed apex and is shorter than the other two. Membranous parts of supraanal process, especially toward apex, covered with innumerable tiny granulations; bearing a pair of barely detectable subapical posterior projections. Lateral stylets attached to base of supraanal process by means of a long strap-like region which is imbedded in membrane; with free apical region of stylets slightly over 0.1 mm. in length, slightly curved, nearly cylindrical, apex blunt, lower surface granulate. Paragenital plates convex, well sclerotized except at tip; similar to those of other species of *Isogenoides*. Subanal lobes moderately large; with a large membranous area covering their central and apical regions.

Female:—length of body, 18 mm.; wings, 15 mm., extending beyond tip of abdomen.

Subgenital plate extending slightly more than half way across segment nine; with posterior margin convex.

BULL. B.E.S. VOL. XLVIII PLATE IV

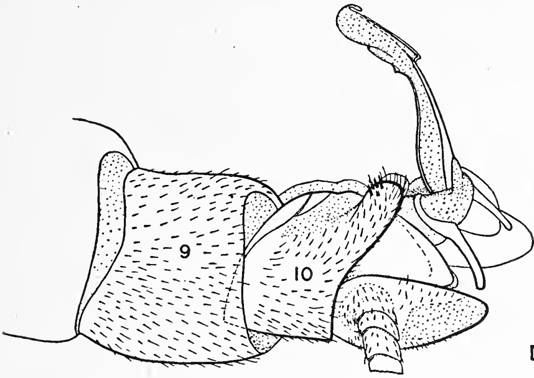


FIG. 1 TERMINALIA, ♂

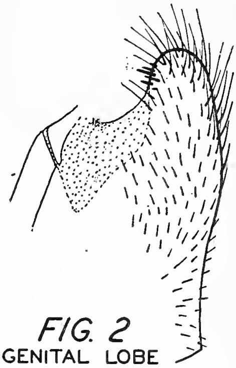
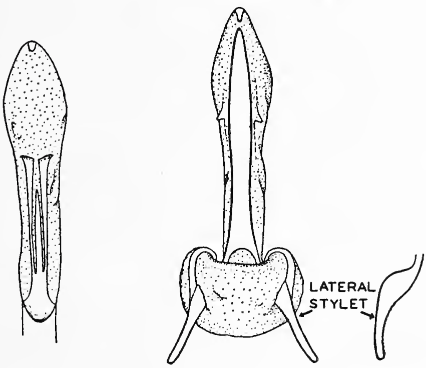


FIG. 2
GENITAL LOBE
DORSOLATERAL VIEW



ANTERIOR VIEW POSTERIOR VIEW LATERAL VIEW

FIG. 3 SUPRAANAL PROCESS

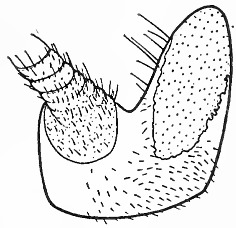


FIG. 4
SUBANAL
LOBE

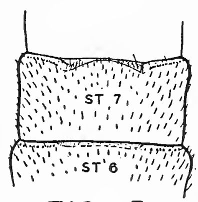
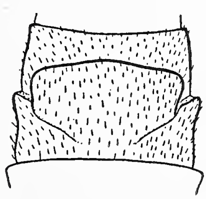


FIG. 5
ABDOMINAL
NAIL, ♂

FIG. 6
♀ SUBGENITAL
PLATE



ISOGENOIDES DORATA FRISON

Naiad:—Frison's description of the naiad cannot be checked at this time, particularly with reference to the color pattern which has faded as a result of preservation in alcohol. It is presumably accurate and of the same species as the holotype specimens since the naiads and exuviae mentioned in the original description were all topotypic. In am hereby designating the exuviae from which the holotype was reared as nepionotype, the exuviae from which the allotype was reared as allonepionotype, and the additional sixteen exuviae and one nymph as paratoponepionotypes. (Although the use of secondary typic terminology has been discouraged in some quarters, since it has no primary value in determining species status, it is my opinion that its usage encourages more systematic and careful work. There have probably been times in the experiences of every taxonomist when such nomenclatorially impotent designations as plesiotype, nepionotype, metatype, or homoeotype would have been of tremendous value in a reappraisal of certain inadequately prepared works.)

Types by original designation of Frison (in Ill. N.H.S.):

Holotype male—near Baldwin, Pere Marquette River, MICH., May 10, 1940 (T. H. Frison, H. H. Ross).

Allotopotype female.

Paratopotypes—1 reared male, 1 female.

Types by present designation (in Ill. N.H.S.):

Nepionotype male—exuviae from which holotype emerged.

Allonepionotype female—exuviae from which allotype emerged.

Paratoponepionotype—1 nymph and 16 exuviae.

Isogenoides hansoni Ricker

1942. *Hydroperla dorata Frison,* ♂♀ and naiad, Bul. Ill. Nat. Hist. Survey 22(2): 295–296, fig. 66 (in part; ♂ and ♀ descr. and figs. apply to *I. hansoni*).

1943. *Isogenoides dorata,* Hanson, Amer. Midl. Nat. 29: 665–669, figs. 4, 8, 14, 15.

1952. *Isogenus* (*Isogenoides*) *hansoni* Ricker, ♂♀ and naiad, Ind. Univ. Publ. Sci. Ser. 18: 111–112.

"This species is readily distinguished from all other known species of *Isogenoides* by the spearhead of yellow pigment extending into the ocellar space. The female may well be confused with other species, such as *varians* or *olivaceus,* on the character of its subgenital plate, but the male is easily distinguished by the dorsal lobes on the tenth tergite, the supraanal process, and the lateral stylets." (Hanson, 1943.)

A detailed description of *I. hansoni* is unnecessary here since it

is supplied in Frison's description under *dorata* (1942) and is supplemented by Hanson's almost simultaneous description under the same name.

Only a few additional collection records have become available to the author and these are from the previously reported Amherst locality.

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NOTICE

Aphids of the Rocky Mountain Region by Miriam A. Palmer has just been published by the Thomas Say Foundation. It consists of 452 pages, 8 colored plates, and 455 figures of line drawings. Keys are provided for the subfamilies, tribes, genera and species.

Although the title indicates a restricted area, as a matter of fact, the volume includes practically all of the species in North America, north of Mexico.

The volume is priced at $10.25 postpaid in the United States, and for other countries $10.50 postpaid. It can be obtained from J. J. Davis, Purdue University, Lafayette, Indiana, and checks made payable to the Thomas Say Foundation.

NEW NORTH CAROLINA COLLEMBOLA.

By D. L. Wray, Raleigh, N. C.

The following two forms of Collembola have been found in the course of collecting within the State, i.e., *Isotoma acrea* n. sp. and *Lepidocyrtus beaucatcheri* var. *olforti* n. var. Types of both forms are deposited in the NCDA Insect Survey Collection.

Isotoma acrea n. sp.

Length up to 1.4 mm. White background over which black pigment is distributed in punctiform dots arranged in strings and groups over head and body, traces also on antennae, basal part of legs and on base of manubrium. Eyes 2 on each side of head situated 1 anteriorly in eyepatch and one removed posteriorly in the lightly separated pigment area; cornea not too prominent. Postantennal organ consists of a broadly elliptical structure of two parts with thickened margins which are not notched in the middle. Unguis untoothed, almost straight, curved only slightly. Unguiculus straight, lanceolate, untoothed and with a broad basal lamella on inner margin. Tenent hair absent. Rami tenaculum quadridentate; corpus with 6 setae situated 3 in an anterior row and 3 in a posterior row. Antennae twice longer than head; proportions of the segments as 20 : 30 : 35 : 55. Organ of 3rd segment consists of 2 large, slightly bent sense rods, one situated anterior to the other, both back of integumentary folds. Mucro tridentate, with the basal tooth being as long as the anteapical one. Dentes twice the manubrium. Body clothing of short curving hairs and long, ciliated hairs which become more numerous and longer on posterior of abdomen.

I. acrea is similar to *I. hyonosenensis* Yosii in that it has two eyes, tridentate mucro, and the unguis is unarmed. It differs, however, in the shape of the postantennal organ and other characters. In general body facies, distribution of the punctiform pigmented spots and areas, and body clothing *I. acrea* is similar to *I. andrei* Mills, *I. minor* Schäffer, and a recently found species *I. tariva,* however, the last two forms are blind, while *I. andrei* has 3 eyes in each eyepatch and all eyes are in close proximity.

Type locality: Acre, North Carolina, taken in leaf mould near a swamp, November 7, 1950, D. L. Wray.

Lepidocyrtus beaucatcheri var. **olforti** n. var.

This is a color form of *L. beaucatcheri* in that it is quite similar

structurally. The chief difference being in the sparseness of pigment dorsally on the thorax and the presence of a distinct band of pigment across the middle of the third abdominal segment, (see Bull. Brooklyn Ent. Soc. 1946, vol. XLI, no. 5, pp. 81–85 for figure of color pattern of *L. beaucatcheri*). Length from 0.75 to 0.9 mm. With a yellowish-white background with purplish-blue pigment as follows: base of antennae lightly pigmented, distal segments heavily pigmented; with pigment on head laterally and anteriorly near base of antennae; pigment on lateral margins of thorax and first two abdominal segments; with a heavy band of pigment across third abdominal segment; pigment on base of legs. Eyes 8 on each side, the inner two smaller. Antennae one and a half times longer than head; proportions of segments as 8: 12: 12: 25. Fourth abdominal segment to third as 55: 15. Unguis nearly straight with one pair of distinct teeth on inner margin. Unguiculus narrow, lanceolate, unarmed. Manubrium to dentes as 35: 40. Body covered with moderate length hairs and scales. Scales heavy and thickly set on venter of dentes.

Type locality: Old Fort, North Carolina. Taken August 29, 1952 from hardwood leaf mould on hillside, D. L. Wray. Also found at Asheville, Mt. Pisgah, Grandfather Mr., and Mt. Mitchell in leaf mould. This form occurs with the forma principalis in large populations and under the same habitat conditions.

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This page is limited to exchange notices and to small For Sale advertisements from members of the Society and from actual paid subscribers to the Bulletin exclusively. *Exchange notices* from members of the Society and from subscribers are limited to *three (3) lines each,* including address; beyond 3 lines, there will be a charge of $1.00 for each 3 lines or less additional. *For Sale* ads will be charged at $1.25 for each 3 lines or part of 3 lines. *Commercial or business* advertisements will not be carried in this page, but will go in our regular advertising pages at our regular advertising rates to *everybody.*

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GEORGE S. TULLOCH E. W. TEALE

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CONTENTS

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BULLETIN

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A NEW HIMANTARIID FROM THE EASTERN UNITED STATES (CHILOPODA: GEOPHILOMORPHA: HIMANTARIIDAE).

By Ralph E. Crabill, Jr., Ithaca, New York.

The present form is of special interest inasmuch as it is one of the very few Himantariids known from the United States east of the Rocky Mountains. It is apparently most closely related to the Texan *Gosiphilus laticeps* (Meinert), the type of which I have examined at the Museum of Comparative Zoölogy at Harvard University. The two are distinct, however, in the following particulars. Chitin lines are absent in *laticeps* but present in *euphorion*. Meinert's form possesses eighty-one pairs of legs; *euphorion* has one hundred and five or more. In addition, the relative size of the various pore fields seems significant. For example, in *laticeps* the pore field of the tenth from the last pedal sternite is 2/3 as wide[1] as its sternite, but in *euphorion* the analogous pore field is only 1/4 as wide as its sternite; the pore field of the twentieth sternite from the head in *laticeps* is more than 1/2 as wide as its sternite, but in *euphorion* the analogous pore field is less than 1/2 as wide as its sternite.

Gosiphilus euphorion sp. n.

Type: ♂, Tuscaloosa, Alabama. April 15, 1949. (B. D. Valentine.) In author's collection, C-1362.

Length: 52 mm. *Color:* uniformly creamy white. *Antennae:* 2.5 times longer than cephalic plate; basally contiguous; first six articles sparsely, the last seven articles densely setose; ultimate article pierced on outer and inner surfaces by a sensory pit each of which contains a number of peculiarly flattened setae. *Cephalic*

[1] By width of the pore field I refer to that dimension that is perpendicular to the longitudinal axis of the body.

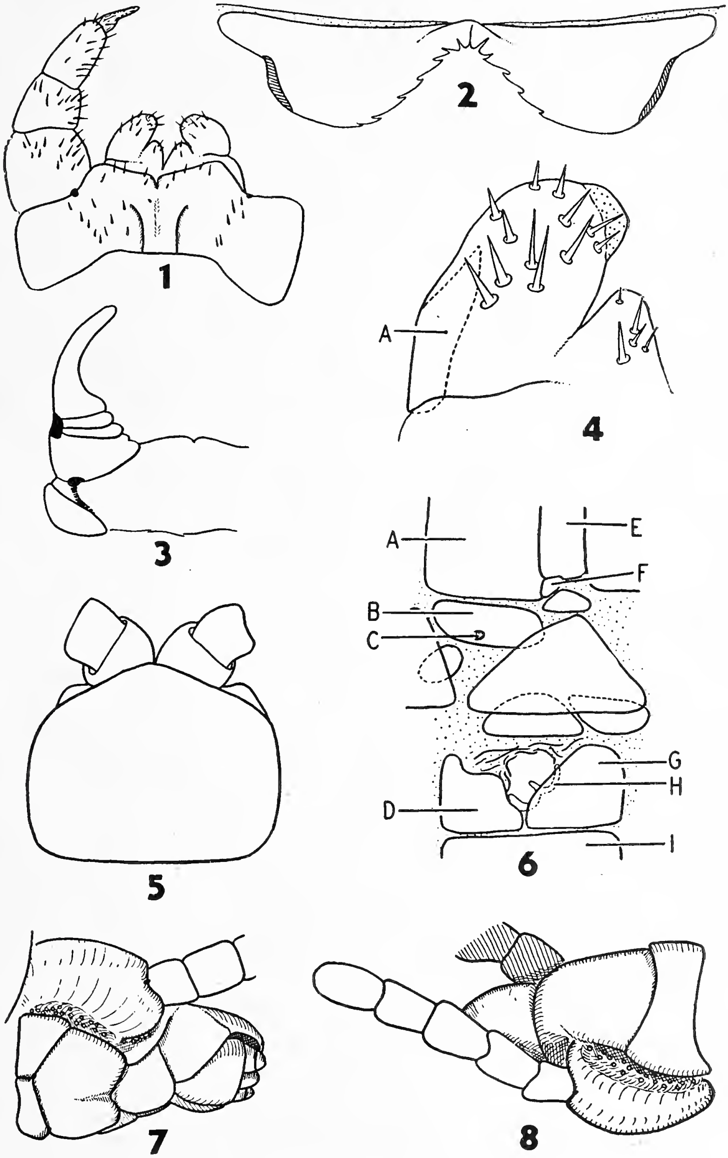
plate: ovate; broader than long (53:42); antero-medially angular, pointed (fig. 5). *Clypeus:* anterior third clothed with some thirty uniformly dispersed setae. *Labrum:* with thirteen distinct teeth; medially so deeply incised as to appear nearly divided (fig. 2). *Mandible:* dentate lamella with eleven teeth, five of which are unpigmented; with five pectinate lamellae. *First maxillae:* telopodite lappets slightly less than half as long as their telopodites; coxosternal lappets lacking (fig. 4). *Second maxillae:* coxosternum medially incised, non-suturate, with a pair of arched paramedian thickenings (fig. 1); apical claw concave on inner surface, with a dorsal and a ventral basal bristle. *Prehensorial segment:* prosternum with distinct chitin lines which attain the condyles (fig. 3); ungula without basal denticle. *Pedal segments:* 105 in number; legs concolorous with tergites, sparsely setose. *Sternites:* without stigma-like lateral pouches; pore fields on sternites two through the pedal ultimate each typically elliptically transverse, medially situated, fields largest on anterior sternites and becoming thinner and shorter posteriorly until the ninetieth sternite after which fields become abruptly larger again, ninety-fifth pore field 1/4 as wide as its sternite, penultimate field 1/2 as wide as its sternite, twentieth field less than 1/2 as wide as its sternite. *Ultimate pedal segment:* sternite distinctly broader than long, sides weakly convergent posteriorly, posterior margin medially deeply incised; dorsal pores in coxopleural fossa bordering entire length of associated tergite and pretergite (fig. 8), ventral pores in a similar fossa bordering sternite which covers a few of the pores (fig. 7); legs finely setose; pretarsus absent.

Allotype: ♀, near Livingston, Cumberland National Forest, Rockcastle county, Kentucky. September 3, 1950. (T. J. Spilman.) In author's collection, C-1364.

Explanation of Plate V

Gosiphilus euphorion sp. n., male holoytpe. 1. United first and second maxillae, left telopodite removed. 2. Labrum. 3. Prosternum and right prehensor. 4. First maxillae, right side. A. lappet concealed behind telopodite. 5. Cephalic plate (dorsal aspect). 6. Right pleural region, segment sixty-two. A. tergite, B. stigmopleurite, C. stigma, D. metacoxa, E. pretergite, F. preparatergite, G. procoxa, H. eucoxa, I. sternite. 7. Ultimate pedal and post-pedal segments, left side (ventro-lateral aspect). 8. Ultimate pedal and post-pedal segments, right side (dorso-lateral aspect).

BULL. B. E. S. VOL. XLVIII PLATE V



The allotype, an immature female, agrees with the type except in the following particulars. *Length:* 20 mm. *Labrum:* with seven teeth. *Mandible:* dentate lamella with eight teeth; with four pectinate lamellae. *Pedal segments:* 109 in number. *Ultimate pedal segment:* each coxopleuron with a single large pore in its dorsal and ventral fossa.

Paratype: ♂, Chilhowee Mountain, Sevier county, Tennessee. October 1, 1950. (E. O. Wilson.) In author's collection, C-1363.

The paratype, like the type, is fully mature. It agrees with the other two specimens except in the following features. *Length:* 35 mm. *Labrum:* with nine teeth. *Mandible:* dentate lamella with eleven teeth; with five pectinate lamellae. *Coxopleural pores:* arranged essentially like those of the type. *Pedal segments:* 105 in number.

Concerning Gosiphilus

The present species is provisionally referred to ***Gosiphilus*** Chamberlin, the type of which is *laticeps* (Wood) (by present designation). This New World genus is undoubtedly very closely allied to, if not identical to, Latzel's *Stigmatogaster,* but according to Chamberlin (in litt.) perhaps the most striking difference between the two is the presence in *Stigmatogaster* of stigma-like sternital pouches which are absent in *Gosiphilus.* Attems,[2] however, included *neglecta* (Brolemann), a form without sternital pouches, in *Stigmatogaster.* A reinvestigation of the forms presently referable to both genera is clearly in order.

I am relatively certain that Verhoeff's *Californiphilus,* described from California,[3] is actually referable to Chamberlin's *Gosiphilus,* which is itself represented by southwestern, Californian, and Mexican forms, one of which Verhoeff might well have had before him when he described *C. michelbacheri,* the type (by monotypy) of his genus.

NOTICE

A special sale of all overstock reprints of articles which have appeared in the new series of **Entomologica Americana** since 1926 is now in progress. A price list may be obtained from George S. Tulloch, 22 East Garfield Street, Merrick, N. Y.

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[2] Das Tierreich, LII, p. 41 (1929).
[3] Zool. Jahrb. (Syst.), LXXI, p. 370 (1938).

NEW SPECIES OF TACHINIDAE FROM MEXICO (DIPTERA)[1]

By H. J. Reinhard, College Station, Texas

The following descriptions of new species of parasitic flies are based upon Mexican material acquired mainly from collections made by Drs. W. G. Downs, M. R. Wheeler and F. A. Cowan. Types of the new species are retained by permission in my collection.

Genus *Microphthalma* Macquart

Microphthalma Macquart, Dipt. Exot., 2, pt. 3, 1843, 241 type, *Tachina disjuncta* Wiedemann (as *nigra,* new species).—Coquillett, Rev. Tach., 1897, 138.—Curran, Ent. News, 36, 1925, 15–18.—Aldrich, Proc. U. S. N. M. 69, 1926, 1–8.

Microphthalma ascita n. sp.

Traces to *cuzana* Townsend in Aldrich's key (loc. cit.), but at once distinguished by the absence of ocellars, wholly black legs, third antennal segment reddish at base, etc.

Male.—Front at vertex 0.30 of head width, nearly equibroad on upper third thence widening rapidly forward; head black only the broad cheek groove and parafacial pale or reddish in ground color; parafrontal with dense yellowish gray pollen extending to vertex; frontalia reddish to brown wider than parafrontal; frontals about seven in a row, one below antennal base, the upper pair stoutish and decussate; no orbitals; outer vertical about half as long as inner; parafacial subequal facial width, beset with scattered short black hairs; antenna extending a little over halfway to vibrissae, basal segments reddish yellow, third concolorous nearly to middle thence blackish and about one-half longer than second; arista short, black, pubescent, proximal segments small; vibrissae approximated, strongly narrowed epistoma unusually produced downward and exceeding clypeal length; proboscis short, labella large; palpus slender but rather short, yellow; cheek subequal eye height.

Thorax black, with dense cinereous pollen; notum marked with four narrow dark vittae all interrupted at suture and fading out before base of scutellum; dorsocentral 3, 3; acrostichal 2, 2 (none immediately before or behind suture); presutural 2 (both strong); intraalar 2 (one next behind suture vestigial); sternopleural 3; anterior spiracle fringed with deep brownish to black hairs. Legs

[1] Contribution No. 1700, from the Department of Entomology, Texas Agricultural Experiment Station.

rather slender and moderately elongate; mid tibia with two antero-dorsal bristles; claws and pulvilli elongate. Wing subhyaline; veins reddish to brown, third with 3 to 5 hairs near base; first posterior cell open far before wing tip; cubitulus with a long stump; costal spine long; epaulet black; calypters opaque white.

Abdomen black apex usually with an apparent reddish tinge in ground color, last three segments gray pollinose; apical third of intermediate segments darker but with thin brown pollen apparent in a flat rear view, anal segment subshiny and strongly bristled on apical half above; one pair of median marginals on second segment and third with a complete marginal row; genital forceps fused, triangular in rear view, tapering to a shiny pointed beak; accessory process slender or fingerlike beyond base; fifth sternite moderately exposed, with a wide V-shaped apical excision.

Female.—Vertex 0.36 of head width, front gradually widening to antennal base; parafrontal yellow to golden pollinose, this color extending on upper part of parafacial; two stout proclinate orbitals; abdomen shorter and broader than in male, anal segment reddish yellow from discal row to apex; genitalia red, retracted; claws and pulvilli shorter than last tarsal segment.

Length, 7–9.5 mm.

Holotype male and allotype female, Acatlipa, Morelos, Mexico, September 16, 1950 (W. G. Downs). Paratypes: 3 males, same data as type.

Microphthalma pedalis n. sp.

Similar to the preceding species except as follows:

Male.—Head pollen wholly cinereous; antenna longer and reaching lower third of face, third segment slightly over twice length of second; epistoma shorter and more distinctly widened below; vertex 0.34 of head width; pulvilli about one-half as long as last tarsal segment; abdomen wholly black in ground color, apical third or more of last three segments subshining in direct view; hypopygium wholly black.

Length, 10 mm. Female unknown.

Holotype: Chipinque, Nuevo Leon, 1440 meters, September 22, 1950 (L. Navarro). Paratype: Male, same data as type.

Genus *Euhystricia* Townsend

Euhystricia Townsend, Ins. Insc. Mens., 2, 1914, 84 (type, *E. nigra* new species); Manual of Myiology, Part 8, 1939, 26–27.

Euhystricia cussiliris n. sp.

Differs from the description of *E. nigra* in having the haustellum distinctly shorter than one-half the head height; palpi much larger and subequal length of third antennal segment; scutellum with only three laterals; abdomen thinly brown pollinose on deep red ground color becoming darker along median line above. Other differences are listed below.

Male.—Vertex 0.21 of head width, front hardly widening on upper third thence rapidly so into facial angle; parafrontal plumbeous; parafacial, clypeus, cheek and occiput with dense gray to silvery pollen; frontalia deep brown, at middle subequal parafrontal width; ocellars strong, proclinate; inner verticals long, decussate; four or five frontals beneath antennal base; antenna black, third segment subequal parafacial width and a little over twice length of second; arista micro pubescent, thickened on basal two-fifths, second segment about twice as long as wide; parafacial bare, about one-third clypeal width; vibrissae on level with front edge of oral margin, which is only moderately produced; facialia with three or four bristly hairs on lower extremity; eyes densely pilose; cheek nearly two-fifths eye height; occiput thickly pale-haired.

Thorax black, thinly gray pollinose, dorsal vittae indistinct. Chaetotaxy: humeral 5–6; notopleural 2; presutural 2 (inner one weak); supraalar 3; intraalar 3; dorsocentral 3, 3; acrostichal 3, 3; postalar 3; sternopleural 3; pteropleural 1 (larger than sternopleural); scutellum reddish in ground color, thickly beset with slender suberect spinelike macrochaetae, with 1 pair of longer curved discals and 3 strong laterals well differentiated; propleuron bare. Legs black, tibiae obscurely reddish, claws and pulvilli elongate. Wing subhyaline; costal spine not developed; third vein setulose nearly halfway to small cross vein; first posterior cell open well before wing tip; cubitulus without a stump or fold; calypters black, bare above.

Abdomen short, wider than thorax, convex upper surface thickly beset with erect bristles and hairs; segments two to four each with a well differentiated marginal row besides a complete discal row on last two; second segment with two pairs of irregularly spaced median discals and first bearing two or three pairs of slender erect median marginals; hypopygium subshining blackish, moderately large; forceps united, free portion gently bowed, tapering to sharp tip; accessory process bladelike, with anterior apical extremity produced as a minute hook, black-haired on outer side; fifth sternite

black, V-shaped apical excision not extending to middle, lobes small, beset with long fine black hairs.

Length, 12 mm. Female unknown.

Holotype: Rio Frio, Mex., Mexico, September 3, 1947 (F. A. Cowan and M. R. Wheeler).

Genus *Peleteria* Robineau-Desvoidy

Peleteria Robineau-Desvoidy, Essai Myodaries, 1830, 39 (type, *P. abdominalis* new species).—Curran, Trans. Royal Soc. Can., Sec. 5, 1925, 225–57.—Townsend, Manual of Myiology, Pt. 8, 1939, 54–55.

Peleteria carnata n. sp.

A large and very robust species with thorax densely pollinose above and abdomen wholly shining black, only the anal segment with pollen at sides above.

Female.—Front at vertex 0.42 of head width; parafrontal subgolden to vertex, parafacial and cheek with somewhat paler yellowish white pollen on pale background; frontalia light reddish yellow, much narrower than parafrontal; three proclinate orbitals; antenna red basally, third segment black, broadly rounded above and obliquely tapering apically, about two-thirds as long as second segment; basal segments of arista moderately elongate, the second slightly longer than first; palpus very slender to tip, yellow, about as long as haustellum; parafacial broad, sparsely clothed with black hairs and two stout bristles near eye margin below; cheek with sparse longish black hairs, one-half eye height; back of head clothed with dense pale yellow pile.

Thorax black, with rather heavy yellowish gray pollen; mesonotal vittae narrow, outer pair broadly interrupted at the suture and inner ones stopping shortly behind same; acrostichal 3, 3; dorsocentral 4, 4; sternopleural 2, 1; pteropleural 2 (large); scutellum obscurely reddish apically, with 4 lateral, 1 decussate apical, 1 preapical and numerous erect discal bristles.

Legs black; intermediate segments of front tarsus distinctly widened and flattened; middle tibia with a row of about six stout bristles on outer front side; claws and pulvilli moderately elongated but shorter than last tarsal segment.

Wing gray hyaline; first posterior cell open far before wing tip; cubitulus subacute, with a distinct fold; hind cross vein in plane of apical and joining fourth at less than one-third the distance from cubitulus to small cross vein; last section of fifth vein about two-

fifths as long as the preceding; calypter white; epaulet black.

Abdomen short, broad ovate, wholly shining black with thin and somewhat changeable subsilvery pollen on outer margin of anal segment beyond the basal border; second segment with one pair of median marginals, third and fourth each with a marginal row besides a discal row on last; sternites exposed apically and beset with stout bristles. Male unknown.

Length, 14–15 mm.

Holotype female, Zamora, Mich., Mexico, August 27, 1947 (F. A. Cowan and M. R. Wheeler). Paratype: 1 female, same data as type.

Genus *Juriniopsis* Townsend

Juriniopsis Townsend, Ins. Insc. Mens., 4, 1916, 73 (type *J. adusta* Wulp, equals *floridensis* Townsend).

Juriniopsis lampuris n. sp.

The smaller less robust build and shining blue-black abdomen readily distinguish this species from both *J. adusta* and *J. aurifrons.*

Male.—Front at vertex 0.34 of head width; parafrontal yellowish gray pollinose to vertex; frontalia reddish brown, moderately pollinose, narrower than one parafrontal on entire length; frontal bristles stout, in two rows anteriorly diverging widely on parafacial below antennal base; ocellars and proclinate orbitals absent; two strong verticals, inner pair decussate; first and second antennal segment reddish, third largely blackish, strongly convex on anterior edge and subequal length of second; arista finely pubescent, thickened and evenly tapered to middle, second segment about three times longer than wide; parafacial a little narrower than clypeus, silvery, outer half with black hairs becoming bristly below; cheek silvery, sparsely black-haired, nearly one-half eye height; proboscis approximating head height, haustellum moderately slender, subequal length of palpus; latter yellow, clavate; occiput densely clothed with pale yellowish pile.

Thorax black at most lightly dusted with grayish pollen, notum subshining; scutellum obscurely reddish brown, with 5 unequal lateral bristles and 2 pairs of apical spines, entire disc covered with short, erect spinose macrochaetae and 1 longer depressed pair of discal bristles; propleuron black setose. Legs black, tibiae brownish; claws and pulvilli strongly elongate and subequal combined length of last two tarsal segments; hind coxa pilose on posterior apical margin. Wing slightly infuscated becoming much darker or blackish at base; veins brown, third setose near base and the first

sometimes with 1 or 2 adventitious hairs before apex; first posterior cell open far before wing tip; costal spine vestigial; epaulet and subepaulet reddish; calypter black.

Abdomen polished blue-black; second segment with 3 to 5 marginal pairs of unequal spinelike macrochaetae, third with a complete marginal row and fourth beset with shorter spinelike bristles on apical half above; hypopygium small, retracted in repose; forceps rather short, united base convex and thickly haired behind, tapering apical half divided but not divergent; apex of accessory process curved inward and rather broadly excised, the anterior fingerlike lobe longer than posterior; sternites widely exposed and beset with spiny bristles.

Female.—Vertex 0.37 of head width; two stout proclinate orbitals; frontalia reddish, dusted with white pollen, parafrontal yellowish as in male; fore tarsi not conspicuously flattened or widened; claws and pulvilli shorter than apical tarsal segment; genitalia black, retracted.

Length, 13.5 mm.

Holotype male and allotype female, Acatlipa, Morelos, Mexico, June 2 and July 29, 1950 (W. G. Downs). Paratype: 1 male, same locality and collector, October 4, 1949.

Genus *Spathidexia* Townsend

Spathidexia Townsend, Jr. N. Y. Ent. Soc., 20, 1912, 110 (type *S. clemonsi* new species); Ins. Insc. Mens., 4, 1916, 23.—Reinhard, Bul. Brk. Ent. Soc., 29, 1934, 150–54.

Spathidexia nexa n. sp.

Female.—Similar to *clemonsi* but the chitinized larvipositor distinctly wider and more tapering distally. Other minor distinctions are listed below.

Front at vertex 0.33 of head width; head pollen silvery on black background; frontalia deep brown, subequal width of one parafrontal, latter sparsely clothed with pale hairs; outer vertical differentiated but not very large, two proclinate orbitals and good-sized proclinate ocellars; one frontal below antennal base; parafacial bare, strongly narrowed below; vibrissae strong, on oral margin; facialia bare; antenna black, second segment reddish, about one-third length of third which also shows a reddish tinge at extreme base; arista black, short-haired nearly to tip; cheek about one-eight eye height; palpus spatulate, reddish yellow; proboscis short; occiput thinly pale-haired.

Thorax and scutellum black, densely gray pollinose, notum not distinctly vittate; acrostichal 3, 3; dorsocentral 3, 3; presutural 1 (outer); sternopleural 1, 1; pteropleural 0; intraalar 3; supraalar 3; postalar 2; scutellum with 3 lateral, 1 apical and 1 discal pair; pleura wholly pale-haired; postnotal slope, propleuron and prosternum bare. Legs black tibiae with a slight reddish tinge in ground color; mid tibia with one anterodorsal bristle; claws and pulvilli small. Wing gray hyaline; veins brownish, third setulose about to middle of first posterior cell; latter open shortly before wing tip; cubitulus broadly curved without stump or fold; costal spine distinct; epaulet black; calypter white.

Abdomen shining black, last three segments with defined silvery pollen bands on about basal two-fifths; one pair of median marginal bristles on second segment and a complete row of stout bristles on hind edge of last two; chitinized retractile larvipositor shining black, about one-third wider than in *clemonsi,* grooved dorsally along median line and evenly narrowed distally to a blunt tip.

Length, 6.5 mm. Male unknown.

Holotype: Mexico City, D. F., Mexico, July 15, 1951 (W. G. Downs).

Genus *Lasioneura* Coquillett

Lasioneura Coquillett, Jr. N. Y. Ent. Soc., 3, 1895, 50 (type, *L. johnsoni* new species); Rev. Tach., 1897, 59.

Lasioneura dextella n. sp.

Male.—Very similar to *johnsoni* differing chiefly in having wholly black antennae and the legs largely so.

Male.—Front at vertex 0.33 of head width, with subgolden satiny pollen; cheek including lower extremity of parafacial pale gray; frontalia four or five times wider than one parafrontal; two proclinate orbitals; outer verticals strong; frontals six to eight in a single row, one below antennal base; ocellars well developed; parafacial and parafacialia bare; vibrissae on oral margin; arista thickened to apical third or beyond, second segment slightly longer than wide; palpus yellow; haustellum rather slender, moderately elongate; back of head considerably bulged on lower extremity, sparsely pale-haired. Thorax and scutellum black, with thin yellowish gray pollen; three post dorsocentrals and three sternopleurals; scutellum with two lateral bristles, apicals and discals lacking. Legs black, trochanters reddish, hind coxa with a strong spine at apex below (similar to genotype in this respect); claws and pulvilli small.

Wing membrane with a light yellowish tinge; first vein setulose almost to tip and third nearly to small cross vein; first posterior cell open near wing tip; costal spine vestigial; calypter whitish tinged with yellow; epaulet black. Abdomen black above, sides of two basal segments and venter largely reddish in ground color; no discals, a row of marginals on last two and one pair of weak depressed median marginals on first two segments; genitalia as in *L. johnsoni.*

Length, 5.5 mm. Female unknown.

Holotype: El Zarco, Morelos, Mexico, Alt. 9,000 ft., September 3, 1950 (E. Bordas).

PUBLICATIONS RECEIVED

Plant Diseases in Orchard, Nursery and Garden Crops, by Ernst Gram & Anna Weber. Translated from Danish by Evelyn Ramsden and edited and adapted by R. W. G. Dennis of the Royal Botanic Gardens, Kew, England. 618 pp., 350 textfigures and 10 plates in color. $8 \times 11\frac{1}{2}$ ins., cloth bound. 1953. Philosophical Library, Inc., New York, N. Y. (Price, $18.50.)

A Revision of the Scale-Insects of Florida, by G. B. Merrill. 143 pp., 112 textfigures. 6×9 ins., paper bound. 1953. Published by the State Plant Board of Florida, Gainesville, Florida.

SPECIAL ANNOUNCEMENT

A limited cloth bound reprint edition of **An Illustrated Synopsis of the Principal Larval Forms of the Order Coleoptera** by A. C. Boving and F. C. Craighead is in preparation and will be released on October 15, 1953. Orders postmarked by midnight, October 15, 1953 accompanied by check or money order will be filled at a special pre-publication price of $7.50 (foreign, $8.00), thereafter the price is $10.00 (foreign, $10.50).

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UNDESCRIBED SPECIES OF NEMATOCEROUS DIPTERA. PART III.

By Charles P. Alexander, Amherst, Mass.

The preceding part under this general title was published in 1953 (Bull. Brooklyn Ent. Soc., 48: 41–49). At this time I am characterizing some species of unusual interest in the families Tanyderidae, Ptychopteridae, and Blepharoceridae, the types being preserved in my personal collection except where indicated to the contrary.

Tanyderidae

Radinoderus supernumerarius n. sp.

Size relatively small (wing, male, under 10 mm.); general coloration dark brown and gray, the disk of the praescutum virtually covered by three brown stripes; legs brown; wings whitish subhyaline, with an extensive banded brown pattern, including oblique bands at cord and over outer end of cell *1st* M_2, the bands much broken by pale spots and frecklings; a supernumerary crossvein in cell R_3.

Male: Length about 8 mm.; wing 9.5 mm.

Rostrum moderately produced, nearly as long as the remainder of head, brownish black; palpi black. Antennae broken beyond the second flagellar segment; black, the apex of the pedicel more reddened; basal flagellar segments cylindrical, with abundant coarse scattered verticils. Head light gray; anterior vertex at narrowest point very reduced, only a little more than the width of a single row of ommatidia.

Cervical region stout, dark brown. Pronotum short, dark brown, the sides narrowly gray. Mesonotal praescutum with sides and humeral region restrictedly light gray, the disk chiefly covered by three dark brown stripes; posterior sclerites of notum chiefly brown, variegated with gray, the latter including the scutellum. Pleura variegated with brown and light gray. Halteres with stem pale yellow, knob dark brown. Legs with all coxae and trochanters brownish gray; remainder of legs brown, the femoral bases narrowly yellowed, least so on the posterior legs. Wings with the restricted ground whitish subhyaline, with an extensive banded brown pattern, the areas much broken by pale dots and specks; there are two major bands, both oblique, one at cord, the second over the outer end of cell *1st* M_2, interconnected in costal field and again along vein *Cu;* basal band more or less connected with an

irregular pattern at and near the arcular region; outer band sending seams to the border at ends of all the veins; both bands with a very narrow but continuous brown outer margin that is bordered internally by a row of whitish spots; veins yellow, darker in the patterned areas. Wing tip slightly falcate. Venation: *Rs* strongly sinuous at midlength, the outer end of cell *R* not strikingly modified, as in certain other species of the genus; R_{2+3+4} longer than the basal section of R_5; a supernumerary crossvein in cell R_3, connecting with vein R_3 near its base, the two elements subequal; *m-cu* at near midlength on vein M_{3+4}.

Abdomen, including hypopygium, chiefly dark brown, the more basal tergites variegated with paler, including a more distal area on either side of tergite two.

Habitat: Dutch New Guinea.

Holotype: ♂, Iffar, Lake Sentani, near Hollandia, swept from foliage over stream, August 1936 (L. E. Cheesman); British Museum (Natural History).

Radinoderus supernumerarius is quite distinct from other described members of the genus, differing most evidently in the wing pattern and venation, as the presence of a supernumerary crossvein in cell R_3. The most similar regional species appears to be *R. oculatus* (Riedel), of extreme eastern Papua, which differs in the size, pattern of the legs and wings, and in the venation.

Ptychopteridae

Bittacomorphella thaiensis n. sp.

General coloration of thorax polished black, the postnotum and pleura silvery pruinose; legs black, tarsal segments two and three pure white, including the vestiture; wings subhyaline, the outer three-fourths of cell *R* blackened to form an elongate stigmal area; vein *Cu* strongly sinuous to angularly bent at near midlength.

Female: Length about 9 mm.; wing 7 mm.; antenna about 4 mm.

Front brilliantly silvery; palpi light brown. Antennae black throughout, slightly more than one-half the length of the wing in the female; flagellar segments elongate-cylindrical. Head blackened above, the anterior vertex silvery.

Thoracic dorsum polished black, mediotergite more pruinose, microscopically punctured. Pleura and pleurotergite silvery pruinose, the ventral pleurites blackened. Halteres black. Legs with the fore coxae blackened except at tips, the remaining coxae and trochanters whitened; femora dark brown, restrictedly brightened at base, the tip passing into black; tibiae and basitarsi black; tarsal

segments two and three pure white, the much smaller fourth and fifth segments black. Wings subhyaline or weakly suffused, with iridescent reflections, the costal border more hyaline; outer three-fourths of cell R_1 blackened to form an elongate stigmal area in that cell; veins brownish black. Venation: *r-m* at or before fork of *Rs*, R_{2+3} lying close to vein R_1; vein *Cu* strongly sinuous to angularly bent at near midlength, the point of angulation almost coinciding with the fold in cell *1st A*, which here simulates a longitudinal vein.

Abdomen black, the posterior borders of the intermediate segments narrowly pale. Ovipositor with weak fleshy valves.

Habitat: Thailand.

Holotype: ♀, Doi Chom Cheng, at Miss Lemmon's Cabin, Chiengmai, altitude 3000 feet, January 1, 1953 (Prayoon C). *Paratopotype:* ♀. *Paratype:* ♀, Near Wat at Doi Sutep, Chiengmai, February 1953 (Deed C. Thurman).

The discovery of a species of phantom crane-fly in the Oriental Region came as a great surprise. To this date only five species of *Bittacomorphella* Alexander had been discovered, one in the eastern Nearctic, two western Nearctic, and two eastern Palaearctic (Honshu, Japan). The present fly is most similar to *Bittacomorphella nipponensis* Alexander, differing most evidently in the pattern of the legs and wings. In the latter species, the tips of all basitarsi are whitened.

Blepharoceridae

Edwardsina luteipleura n. sp.

Male: Length about 5 mm.; wing 8.5 × 2.8 mm.; antenna about 3.7 mm.

Characters mostly as in *Edwardsina dispar* Edwards, with which it agrees in the unusually long antennae, differing in coloration and in all details of structure of the mouthparts and male hypopygium. The chief points of difference from *dispar* are:

Maxillary palpi much longer, especially the elongate first segment which is about one-third longer than the second and about six times as long as broad, the blade of the maxilla not attaining its outer end; sensory structure of second segment very conspicuous, appearing as an oval knob. Antennae with the intermediate flagellar segments fully four times as long as broad, cylindrical. Head and pronotum dark brown to brownish black.

Mesonotum light brown, paling to gray laterally; median prae-

scutal stripe very broad in front, distinctly divided by a ground line; scutellum, postnotum and pleura uniformly yellowish, sparsely pruinose, with no darkening of the ventral pleurites; sides of scutellum beneath with an area of short black setae. Halteres blackened, only the base of stem yellowed. Legs uniformly dark brown, the outer tarsal segments passing into black; fifth tarsal segment much shorter than the third; claws with two major very long outer teeth and a smaller more basal one. Wings nearly hyaline, the darkened stigmal region very reduced, more yellowed; veins black very distinct against the ground. Venation: *Rs* oblique; cell R_3 almost sessile.

Abdomen with tergites chiefly dark brown, gray pruinose; basal sternites yellowed; hypopygium brownish black. Male hypopygium with the outer third of the dististyle strongly narrowed to the obtuse tip. Penis filaments not flanged on basal half, the extreme base merely slightly dilated.

Habitat: Chile.

Holotype: ♂, Curacautin, Malleco, December 6–24, 1950 (L. E. Peña).

Blepharocera yankovskyi n. sp.

Size medium (wing, male, 5.8 mm.); mesonotum brown, the surface subnitidous; scutellum brownish yellow; eyes (male) very large unequally bisected, the upper reduced section of moderate size; wings crystal clear, the costal cell more yellowed; *Rs* less than twice *r-m;* male hypopygium with the setae of the tergal lobes long and conspicuous, relatively sparse; outer dististyle very large, bilobed.

Male: Length about 5 mm.; wing 5.8 mm.

Eyes of male very large, especially the anterior or lower part, the upper section small but not greatly reduced as in *yamasakii* or *japonica.* Ocelli large and conspicuous, the posterior pair separated by a distance less than one-half their own diameter.

Mesonotum brown, the surface subnitidous; scutellum brownish yellow. Pronotum and pleura gray pruinose, the metapleura yellowed. Halteres yellow, knobs dark brown. Wings crystal clear, the costal cell more yellowed. Venation: *Rs* less than twice *r-m.*

Male hypopygium with the tergal lobes relatively narrow, the setae long and conspicuous, relatively sparse. Outer dististyle very large, bilobed, each lobule of approximately the same size and shape; inner dististyle small, parallel-sided, the tip obtuse.

Habitat: North Korea.

Holotype: ♂, Ompo, altitude 600 feet, November 8, 1937 (Yan-

kovsky).

I take great pleasure in dedicating this species to the collector, Mr. Alexander Yankovsky. The most similar species appears to be *Blepharocera japonica* Kitakami, which is much smaller, being one of the smallest known members of the genus (Male, length 2.6–3.5 mm.; wing 3.2–4.2 mm.). As indicated above, both *B. japonica* and *B. yamasakii* Kitakami have the upper division of the eye of the male very reduced. The general localities where Yankovsky collected in Northern Korea have been discussed in another paper by the writer (Trans. Roy. Ent. Soc. London 95: 227–228; 1945).

Blepharocera dimorphops n. sp.

General coloration of thorax shiny black; eyes of the two sexes very dissimilar, in the male large and apparently undissected, in the female profoundly divided, the two divisions separated by a broad band of the head, the flattened upper eyes with large ommatidia, the convex lower pair with small ommatidia and very short setae; posterior femora yellow with a broad blackish band at near midlength; wings subhyaline; *Rs* about twice *r-m;* veins R_4 and R_5 divergent, cell R_4 at margin about one-half more extensive than cell R_2; abdomen conspicuously bicolored, velvety black, the basal rings of the tergites gray pruinose, of the sternites narrowly yellowed.

Male: Length about 5 mm.; wing 4.8 mm.

Female: Length about 6 mm.; wing 6.2 mm.

Male. Terminal segment of palpus very long, subequal to segments two and three taken together. Antennae with the terminal segment approximately twice the penultimate. Eyes large, apparently not bisected to any degree, the ommatidia of the outer convex face larger but merging gradually with the small ommatidia nearest the vertex; setae short. Head dark.

Thorax shiny black, the region surrounding the wing bases paler; pleura weakly pruinose. Halteres with stem brown, the basal third yellow, knob brownish black. Legs with the fore coxae blackened, the others and all trochanters yellow; remainder of legs brownish black, the femoral bases yellowed; posterior femora much larger, chiefly yellow, with a broad blackish band at near midlength; claws relatively short, weakly protuberant at near midlength. Wings subhyaline, the prearcular and costal fields narrowly darkened; veins brownish black. Venation: *Rs* about twice *r-m;* veins R_4 and R_5 diverging strongly on their outer halves, cell R_4 at margin about one-half more extensive than cell R_2.

Abdomen conspicuously bicolored, the first tergite and basal rings of the succeeding ones gray pruinose, the much broader posterior portions deep velvety black; sternites brownish black, the bases narrowly but conspicuously yellow. Male hypopygium with the tergal notch relatively wide. Dististyle with the outer lobe more extensive, expanded outwardly, the tip broadly obtuse; inner lobe smaller, the setae more approximated; inner dististyle a tiny glabrous rod.

Female. Much as in the male, differing notably in the structure of the eyes. Antennae strongly narrowed outwardly, the terminal segment very long, nearly as long as the preceding two combined. Head tetrophthalmous, the upper and lower eyes bisected and separated by a broad band of the head; upper eyes flattened, the ommatidia large, the setae relatively long and conspicuous; lower pair of eyes with small ommatidia and very short setae. Facial patches oval in outline, the setae black.

Habitat: China (Fukien).

Holotype: ♂, Ta-chu-lan, altitude 1500 meters, June 25, 1948 (Joseph Fu). *Allotopotype:* ♀, June 22, 1948.

The difference in structure of the compound eyes in the two sexes is very striking, from simple or virtually so in the male to broadly tetrophthalmous in the female. The eye in this latter sex is generally similar to the condition found in the Bornean *Blepharocera tetrophthalma* Edwards, which seems to be the nearest relative. No members of the family *Blepharoceridae* had been recorded from China except from the Tienshan Mountains, far to the west on the border between Mongolia and the Soviet Union.

Blepharocera thurmanæ n. sp.

Size small, especially the male (wing, 4 mm. or less); general coloration of thorax dark brown, the pleurotergite and posterior pleurites paler; eyes of male with upper facetted area contiguous with the lower one or separated by a capillary sclerotized strip, in the female the band broader; male hypopygium with the outer dististyle widened outwardly, emarginate at apex.

Male: Length about 3.5–4 mm.; wing 3.5–4 mm.

Female: Length about 5.5 mm.; wing 5.5 mm.

Described from alcoholic material.

Male. Antennae short, the basal flagellar segments shorter than broad, the outer ones more elongate, approximately one-half longer than broad; terminal segment nearly one-half longer than the

penultimate. Eyes very large; dorsal area of larger ommatidia greatly restricted when compared with the major ventral portion comprised of small ommatidia, without a sclerotized separating band as in female, or this reduced to a capillary line. Head dark.

Thorax dark brown, the pleurotergite and posterior pleurites paler. Halteres with the large knobs dark brown, the base of stem yellow. Legs with the coxae and trochanters pale, the fore coxae darker; legs brown to dark brown, the femora narrowly yellowed basally. Wings hyaline, the costal cell infuscated, especially outwardly; veins brown. Venation: *Rs* ranging from subequal to about one-half longer than *r-m;* branches of *Rs* sinuous, R_5 ending immediately above the wing tip.

Abdomen vaguely bicolored, dark brown to brownish black, the bases of segments two to four, inclusive, obscure yellow to produce a banded appearance; hypopygium black. Male hypopygium with the outer dististyle relatively large, widened outwardly, emarginate at apex to produce two lobes, the upper one with coarse setae.

Female. As in the male, differing in the sexual characters, especially of the eyes. Dorsal ommatidia larger and more numerous than in the male, separated from the large ventral section by a sclerotized strip, producing a four-eyed appearance; ventral ommatidia small, their area scarcely one-eighth to one-tenth that of the large dorsal ones. Mid-coxal lobe much larger, with abundant black setae.

Habitat: Thailand (Chiengmai).

Holotype: Alcoholic ♂, Chom Tong, altitude 1000 feet, February 9, 1952 (Deed and Ernestine Thurman). *Allotopotype:* ♀. *Paratopotypes:* 4 ♂♂.

I take great pleasure in dedicating this species to Mrs. Deed C. (Ernestine) Thurman, to whom and to her husband, I am greatly indebted for some unusually interesting Nematocerous Diptera from Thailand. The nearest relative seems to be *Blepharocera indica* Brunetti, of the western Himalayas, which is still known to me only from Brunetti's brief original description and figure. This is a larger fly with the colorational and venational details distinct. The structure of the eyes and male hypopygium in *indica* has not been described. This is the first record of a species of the family Blepharoceridae from Thailand.

TWO UNDESCRIBED TINGIDAE FROM INDIA (HEMIPTERA).

By Carl J. Drake, Ames, Iowa
and
John C. Lutz, Philadelphia, Pa.

The present paper contains the descriptions of two new lace-bugs from India. The types are in the Drake Collection, paratypes in collections of both authors.

Dasytingis semota n. sp.

Large, oblong, testaceous with pronotum (hood, collar, paranota and posterior triangular part are testaceous) dark reddish fuscous; some veinlets in paranota, a broad transverse band just in front of middle of costal area and some veinlets in apical part of elytra fuscous to black-fuscous. Legs dark ferrugineous, the tibiae brownish. Head black-fuscous, with spines testaceous. Body beneath brownish fuscous with sterna darker. Rostral leminae, bucculae and most of pleura testaceous. Entire dorsal surface clothed with very short, fleck-like, golden pubescence. Length, 4.10 mm.; width, 2.00 mm.

Head armed with five spines, posterior pair very long, appressed, arising under the fore part of pronotum and extending to front margins of the eyes; median spine much shorter, porrect; anterior pair directed forward with tips touching, a little longer than median. Antennae, moderately long, moderately stout, clothed with very short reclining pale hairs; segments I and II short, moderately incrassate, the latter obconical; III straight, not very slender, three times as long as IV; IV enlarged a little apically, longer than first two conjoined, clothed with longer hairs. Bucculae broad, areolate, contiguous in front. Orifice prominent, with testaceous canal. Hypocostal laminae narrow, composed of a single row of small cells.

Pronotum rather strongly transversely convex, slowly narrowed anteriorly, coarsely punctate, with hind projection areolate (rounded cells), tricarinate; carinae feebly more raised in front, uniseriate, with very small areolae, the areolae becoming obsolete behind; median carina connected in front with median vein of hood, becoming evanescent before reaching apex of hind pronotal process; lateral carinae feebly convex within (almost straight), arising considerably back of hind margin of hood and extending posteriorly to

posterior margin of pronotal process; collar raised, rather broad, areolate, subtruncate in front; hood moderately large, sac-like, inflated; projecting posteriorly and resting on surface of pronotum, not at all extending over basal part of head, wider than thick, nearly twice as long as wide, rounded on top. Paranota moderately wide, a little reflexed, narrow and biseriate in front, widest just in front of humeral angles, there four to five cells deep, the areolae small and somewhat rounded.

Elytra longer and wider than abdomen, at widest part (just behind apex of posterior process) broader than the greatest width across pronotum and paranota; overlapping behind with tips jointly rounded in repose; costal area wide, mostly triseriate (cells smaller) quadriseriate and dark fuscous in band, the areolae clear (excepting in band), moderately large and irregular in arrangement; subcostal area wide, narrower than costal, triseriate, the areolae rounded; discoidal area extending a little beyond the middle of elytra, with hind margin oblique and straight, widest opposite apex of hind pronotal process, there six or seven cells deep, the areolets about the same size as in subcostal; sutural area more widely areolate, with veinlets more or less infuscate and areolate embrowned. Wings nearly as long as elytra, dark fuscous. Female unknown.

Type (male) and 1 *paratype* (male), Karikal, South India, July 15, 1945, P. S. Nathan.

Very similar in general appearance to *Dasytingis rudis* Drake from India, but separated at once from it by the widely explanate paranota just in front of humeral angles. In *rudis* the paranota are almost entirely biseriate and not abruptly widened behind.

Tanytingis assamana n. sp.

Large, very broad, brownish testaceous with reddish fuscous or ferrugineous pronotum; elytra with very broad subbasal and narrower oblique apical bands (including areolae) dark fuscous, also some areolae in basal part of costal area infuscate; paranota brownish; head black with spines brown. Body beneath fuscous-black, somewhat shining. Legs testaceous with tarsi brownish. Antennae testaceous, with basal segment and sometimes also second brown, apical half of last segment black. Length, 4.40 mm.; width, 2.55 mm.

Head with four spines; hind pair longer, appressed, scarcely attaining front margin of eyes. Bucculae broad, rather short, areolate, contiguous in front. Legs slender, indistinctly pilose. Ros-

trum brown, darker apically, barely attaining middle of mesosternum. Rostral channel wide, the laminae low, uniseriate, blackish and very low behind. Orifice indistinct. Antennae moderately long, moderately stout, indistinctly setose; segment I short, thicker and nearly twice as long as II, the latter obconical; III moderately long, slightly more than twice as long as IV (102: 48); IV longer than the first two conjoined, feebly enlarged, slightly bent.

Pronotum moderately transversely convex; slowly narrowed anteriorly, very coarsely punctate, tricarinate, carinae distinct but without areolae; median carina more elevated than lateral pair, becoming indistinct a little before apex of hind pronotal process; lateral carinae very low, parallel, not present on posterior process; calli impressed, black; collar moderately raised, areolate, truncate in front, without any indication of a hood; paranota moderately wide, feebly reflexed, triseriate in front, biseriate behind, subangulately produced in front, with outer margin nearly straight, the areolae small and rounded. Elytra very broad, almost subquadrate, strongly abruptly widened at base, much wider than pronotum including paranota, with outer marginal vein very stout, apically wide and obliquely narrowed inwardly on hind margin; costal area very wide, with areolae variable in size and not arranged in definite rows, with areolae on basal two-fifths (including subbasal band) smaller, five or six inches deep in widest part; subcostal area very narrow, biseriate, the areolae very small, rounded; discoidal area elongate, strongly narrowed at both ends, with outer boundary more sinuate than inner, widest near middle, there four cells deep, the cells not very small; sutural area with cells slightly larger than in discoidal area. Hypocostal laminae very narrow, uniseriate. Wings a little shorter than elytra.

Type (male), *allotype* (female) and 2 *paratypes*, Shillong, Assam, India, Jai K. Uniyal. May 22, 1945.

Separated without any difficulty from *T. takakashi* Drake by the smaller size, much wider paranota, much narrower subcostal area and tricarinate paranota. In *takakashi* the pronotum is more strongly convex and unicarinate, paranota very narrow and uniseriate, and the subcostal area very wide and six areolae deep in widest part. In both species the posterior pronotal process is abbreviated apically with the apex broad and somewhat roundly excavated.

A NEW SPECIES OF THE ANTHOMYIID GENUS HYLEMYA ROB.-DESV. FROM OREGON, REARED FROM FIR CONES (MUSCIDAE, DIPTERA).

By H. C. Huckett, Riverhead N. Y.

The following species of Hylemya, belonging to the subgenus Pegohylemyia, is described at this time owing to its noteworthy habits as a parasite in cones of white fir, *Abies concolor,* collected near Ashland, Oregon. Specimens of the adult were brought to my attention by Mr. C. W. Sabrosky of the United States National Museum, which had been reared from cones of this fir tree collected by Mr. F. P. Keen of the Forest Insect Laboratory at Berkeley, California. Additional specimens have been received from Mr. Keen, which included two females of the allied species *Pegohylemyia anthracina* (Czerny), bred from hemlock cones, *Tsuga mertensiana,* collected in the same locality by Mr. P. D. Sergent, and a male tachinid fly, which had emerged with the rearings from cones of *Abies concolor.* It seems apparent, from information kindly furnished by Mr. Keen, that the habits of the new anthomyiid species are comparable to those of *anthracina,* as reported by Kangas and Leskinen (1943).[1] I have seen additional specimens of *anthracina* from Alaska, Quebec, and New York, also from Jämtland, Sweden.

Hylemya (Pegohylemyia) abietis n. sp.

Male, blackish brown, shining and largely devoid of pruinescence except on head and abdominal terga, the latter by contrast whitish gray dusted and with a dark dorsocentral mark. All appendages blackish. Wings clear, yellowish basad, calyptrae yellowish tinged, halteres yellow.

Eyes at closest approximation separated by a distance about equal to diameter of anterior ocellus, parafrontals contiguous caudad, parafacials narrow, at base of antennae slightly less than width of third antennal segment, cheeks abruptly constricted caudad, arista minutely pubescent. Mesonotum with 2 or 3 pairs of slender well separated presutural acrostical bristles, between which are numerous setulae, posthumeral bristle duplicated below,

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[1] **Kangas, Esko, & Leskinen, K.** 1943. *Pegohylemyia anthracina* Czerny (Dipt., Muscidae) als Zapfenschädling an der Fichte. Ann. Entom. Fennici, IX (3): 195–212.

prealar bristle variable in length, but usually as long as or longer than posterior notopleural bristle, scutellum with numerous discal setulae, upper mesopleural border with a few coarser setulae below anterior notopleural bristle, sternopleurals arranged 2 or 3: 3. Abdomen depressed, broadly formed, processes robust, tapering distad, with a single median series of bristles from base to preapical region, entire inner margin densely fringed with longish hairs and setulae, apical and outer (dorsal) regions of processes largely bare (fig. 3), cerci pilose except for 4 suberect longish bristles near apex, gonostyli incised at apex and appearing slightly spatulate when viewed from the side (figs. 1 and 2).

Fore tibia with 2 or 3 posteroventral bristles, apical posterodorsal absent, anteroventral surface of mid femur with a few bristly setulae or weak bristles near base and with increasingly slender setulae distad, mid tibia with 1 anterodorsal, 1 long and 1 short posterodorsal, and 3 or 4 irregularly placed bristles on posterior to posteroventral surfaces, hind femur with anteroventral series of bristles extending to prebasal region, the longer apical bristles not much longer than height of femur where situated, the proximal bristles shorter, posteroventral surface with a series of short bristles on distal two thirds, hind tibia with 5 anteroventral, 8 to 10 diverse anterodorsal, 4 or 5 posterodorsal, and a proximal series of weaker posteroventral bristles, apical posteroventral well developed. Wings with vein R_{4+5} terminating at apex of wing, costal setulae weak, costa setulose on lower surface, *m-cu* cross vein sinuate, oblique.

Female as in male except mainly for sexual characters; thorax lightly and uniformly grayish dusted, in contrast abdomen entirely shiny, unmarked, with no trace of pruinescence; cruciate bristles present, terminal sclerites of ovipositor appressed dorsoventrad, strongly chitinised, bluntly pointed, sparsely haired, anal palpi foreshortened and conforming in structure to the suranal plate. Fore tibia with a mid anterodorsal bristle, hind femur with a few weak bristles near middle of posteroventral surface, hind tibia with 2 to 4 anteroventral, 3 or 4 posterodorsal bristles. Costal setulae

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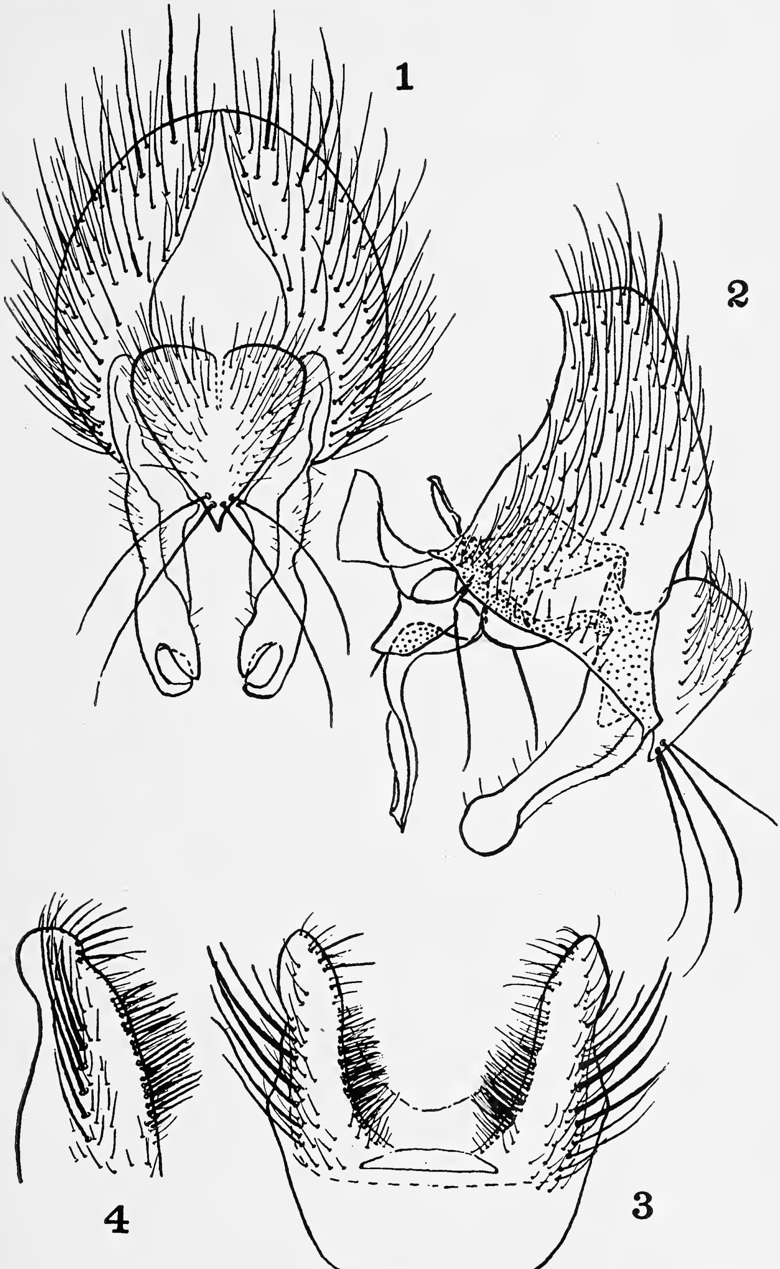
Explanation of Plate VI

Male copulatory appendages of *Hylemya* (*Pegohylemyia*) *abietis* new species.

Fig. 1. Dorsal or caudal aspect of hypopygium. Fig. 2. Lateral aspect of hypopygium. Figs. 3, 4. Ventral aspect of fifth abdominal sternum and lateral view of process.

BULL. B. E. S. VOL. XLVIII PLATE VI



short and stouter, *m-cu* cross vein less sinuate.

Length, 8–9 mm.

The species *abietis* is noticeably larger than *anthracina*, the breadth of third antennal segment less expansive than in that species, and the *m-cu* cross vein more oblique. In the male of *abietis* the calyptrae and basal region of wings are yellowish, processes of fifth abdominal sternum proportionately narrower distad and inner margin densely fringed with coarse setulae, whereas in the male of *anthracina* the wings are densely infuscated basad, and calyptrae and marginal hairs are brownish tinged, the processes are broad and truncated, with a sparse fringe of fine hairs along inner margin; in the female of *abietis* the dorsal terminal sclerites of ovipositor are stouter and more hairless than in *anthracina*.

Holotype: ♂ (No. 13228e-16), emerged May 19, 1916, from cones of *Abies concolor* collected at Long's Ranch, Ashland, Oregon, on September 25, 1915 (F. P. Keen). [U. S. N. M.] Allotype: ♀ (No. 13228e), emerged April 25 to May 31, 1916, from cones of *A. concolor* collected on May 15, 1915 at the same locality as holotype. [U. S. N. M.] Paratypes: 3 ♂, 3 ♀, (No. 13228e), emerged April 25 to May 31, 1916 or May 25 to June 6, 1917, from cones of *A. concolor* collected at Long's Ranch, Ashland, Oregon, May 15 to September 25, 1915 (F. P. Keen), ♀, (No. 13228e), same locality and host, emerged October 28, 1916, cones collected September 25, 1915 (F. P. Keen), ♂, ♀, (No. 13291c), ♂ emerged May 8, 1916, reared from cones of *A. concolor* collected at Palmerlee's Ranch, Ashland, Oregon, September 10 to October 28, 1915 (P. D. Sergent), ♂, (No. 13289a), emerged May 4, 1916, from cones of *A. concolor* collected at Clover Creek, Keno, Oregon, on September 9, 1915 (P. D. Sergent). [U. S. N. M.] ♀, Pinecrest, Tuolumne County, California, August 17, 1948 (P. H. Arnaud, Jr.) [F. M. Snyder].

Aphids in Lizard Stomach: A sagebrush swift lizard, *Sceloporus graciosus graciosus* (B.-G.), was collected among Russian thistle plants in a *Juniperus utahensis* general area at Pine Creek, Utah, on July 8, 1934. Twenty-two aphids out of a larger number present in the stomach, were mounted on a glass slide. These aphids recently were identified by Professor M. A. Palmer as *Braggia echinata* G.-P. It was interesting to find so many aphids in one lizard stomach. It is doubly interesting to have the aphid turn out to be a species rarely collected in Utah.—G. F. Knowlton, Logan, Utah.

A NEW SPECIES OF BIDESSUS FROM SOUTHERN MICHIGAN (COLEOPTERA: DYTISCIDAE)[1]

By Frank N. Young, Bloomington, Indiana

The new species of *Bidessus* described below was discovered during the course of a survey of the water beetles of the Edwin S. George Reserve of the University of Michigan in Livingston County, Michigan. One specimen was found in a cold seepage area, and over a hundred on the quaking bog at the edge of a small glacial relict lake. In the latter situation few of the beetles were taken swimming in open pools, but were collected by depressing a shallow pan into small depressions on the mat. Sphagnum was frequently associated with the areas in which the beetles were found, but the pH of the water was usually near 7.0. In pools and along the edge of the mat *B. affinis* (Say) was common. In a nearby bog, where the pH was lower, only *Bidessus fuscatus* (Crotch) was found on the sphagnum mat. This suggests that these species may replace one another in habitats of different relative acidity.

I take pleasure in naming this distinctive little species in honor of Dr. Irving J. Cantrall, the curator of the E. S. George Reserve, who has assisted greatly in many phases of work on the fauna of the area.

Bidessus cantralli n. sp.

Diagnosis: A small, elongate species probably belonging to the *Bidessus affinis* complex, but differing from *B. affinis* (Say) and related forms in its smaller size, more elongate form, highly polished and more finely punctate dorsum, nearly impunctate head, distinct sutural striae of impressed punctures, longer elytral plicae, and uniformly light reddish brown color. It differs from *B. fuscatus* (Crotch) in being smaller, more elongate, much less coarsely punctate, without conspicuous microsculpture on dorsum, and in being lighter and more uniformly colored. It is readily distinguished from the *B. lacustris* complex by the simple aedeagus of the male. The small size, highly polished surface of the dorsum between the coarser punctures, and the light reddish brown color should make the species easily recognizable.

Holotype male: Elongate oval, with the greatest width at about the middle of the elytra. Total length 1.70 mm.; greatest width 0.89 mm.; width at base of pronotum 0.77 mm.; width at apex of

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[1] Contribution No. 529 from the Zoological Laboratories of Indiana University aided by a grant from the National Science Foundation.

pronotum 0.52 mm.; length of pronotum at midline 0.30 mm.; width between eyes 0.32 mm. *Head* minutely microreticulate, rather dull, with some sparse and irregularly spaced punctures. Vertex almost impunctate. Antennae normal for genus, none of the segments conspicuously dilated. *Pronotum* narrowed anteriorly. Disk very smooth and shining between the larger punctures; microreticulation if present imperceptible by reflected light. Larger punctures moderately coarse, sparse, and irregularly spaced; individual punctures much larger than those on head. Lateral pronotal plicae about 2/3 length of pronotum at midline; deep and irregularly impressed at the base, curving gently outward toward the apex. Lateral margins of pronotum distinct. *Elytra* very smooth and shining between the larger punctures which are about as coarse as those on pronotum. Punctures moderately sparse and irregularly spaced. Sutural striae of impressed punctures distinct at the base, but disappearing before attaining the apex. Discal striae evident due to rows of yellowish hairs, but not otherwise easily distinguished from other punctation. Elytral plicae just slightly shorter than thoracic, deeply impressed and regular. *Venter* microreticulate, but very sparsely punctate. Metacoxal plates with a few coarser punctures. Some coarser punctures along sutures between abdominal segments. Anterior tarsi moderately dilated and compressed with adhesive hairs beneath. Tarsal claws rather small and approximately equal. Epipleurae normal. *Color:* Dorsum and venter nearly uniformly light reddish brown. Tibiae, tarsi, and outer segments of antennae and palpi darker brown. *Parameres and aedeagus* similar to those of *B. affinis* or *fuscatus,* not particularly distinctive.

Allotype female: Almost identical to male from which it can scarcely be distinguished except by the genitalia. Total length 1.73 mm.; greatest width 0.89 mm.; width of pronotum at base 0.77 mm.; width of pronotum at apex 0.54 mm.; length of pronotum at midline 0.31 mm.; width between eyes 0.32 mm.

Variation: Paratypes show only minor differences in color and size. Some collected in July are slightly teneral.

Holotype and allotype in University of Michigan Museum of Zoology, Ann Arbor, Michigan, collected July 30, 1952 on the bog mat at edge of Hidden Lake on E. S. George Reserve near Pinckney, Michigan. 101 Paratypes from same locality collected on July 22, 26, and 30, Aug. 13, and Oct. 27, 1952, 16 additional paratypes from same locality collected June 10, 1953. All specimens were collected by I. J. Cantrall or F. N. Young. Paratypes will be deposited in various museums and private collections.

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Vol. XLVIII DECEMBER, 1953 No. 5

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CONTENTS

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BULLETIN

OF THE

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A NOTE ON THE NESTING BEHAVIOR AND PREY OF AGENIOIDEUS (AGENIOIDEUS) HUMILIS (CRESSON) (HYMENOPTERA, POMPILIDAE).

By Karl V. Krombein, Washington, D. C.

Agenioideus (*Agenioideus*) *humilis* (Cresson) is one of our less commonly collected spider wasps, and relatively little has been published on its ethology. The few published prey records indicate that immature orb weaver spiders of the family Epeiridae constitute the only prey stored by *humilis*. Rau (Trans. Acad. Sci. St. Louis 24: 15, 1922) recorded it as having been collected at Creve Coeur Lake, Missouri, with its prey, a thoroughly paralyzed epeirid spider, *Epeira globosa* Keys.[1] Evans (Trans. Amer. Ent. Soc. 75: 197, 1950) in his revision of the Pompilini stated that one female from Niagara Falls, New York, was pinned with a juvenile epeirid, possibly a species of *Epeira*, and that another female from Sinai Bay, Long Island, New York bore a label stating that it had captured an epeirid, *Epeira pegnia* Walck. [recorded as *Aranea p.*].

Three published records mention various nesting sites, but nothing definite has been published on the actual location and construction of the cell, and two of the records carry the implication that the prey may occasionally just be stuffed into a convenient crevice in masonry. Hurd (Pan-Pacific Ent. 23: 132, 1947) reported rearing *humilis* from cocoons found in pulverized

[1] Dr. B. J. Kaston advises me (*in litt.*) that—"What Rau called *Epeira globosa* Keyserling was probably what either Banks or Bryant at the MCZ determined for him; it is now usually called *Epeira pegnia* Walckenaer. Recently it was shown that the genus *Epeira* is untenable, so we will have to call it *Araneus pegnia*. Or else, according to the most recent 'splitting', *Neosconella p.* (W.)."

sandstone at the base of a cliff at Rock City, Mt. Diablo, California. Evans (U. S. Dept. Agr., Agr. Monogr. 2: 925, 1951) summarized the published and unpublished data at hand then as . . . "nests in sandy places, and around cliffs, walls, and buildings; . . . " Krombein (Trans. Amer. Ent. Soc. 78: 92, 1952) recorded a series from Westmoreland State Park, Virginia, as nesting in crevices in masonry foundations of a log cabin. I have since (1953) taken several specimens in a similar situation at Lost River State Park, West Virginia, and others while running or flying over a very small talus slope of rocky soil along one of the park trails.

The following observations establish that *humilis* occasionally (perhaps always?) constructs the cell for its prey in the manner of a typical ground nesting pompiline, though probably always in rather unusual media. On July 28, 1953, I was observing the nesting activities of several species of the sphecid wasp, *Spilomena,* which were nesting in the wooden walls of a disused lean-to cow-shed attached to my garage in Arlington, Virginia. The *Spilomena* were entering burrows both outside and inside the shed, and it was while noting the activities of some of the specimens within the rather gloomy interior, that I saw a female *Agenioideus humilis* (72853 F) at 10 a.m., E. S. T., on the ground next to the exterior wall. A board had been removed from the wall near this area and enough light was admitted so that her actions could be observed. When I first saw her she was scratching with her fore-legs and tugging with her mandibles at the sheet web of a spider which covered a crack half an inch wide at the base of the wall. I supposed at first that she was attempting to get at this spider to use it as her prey, but it was soon apparent that she was only removing the web to reach the debris which filled this crack between the concrete floor and the wooden foundation of the exterior wall. When she reached this debris, which appeared to consist largely of small grains of decomposed vegetable matter with inter-mixed particles of sand and soil, she began to dig with her forelegs a tunnel which penetrated the debris at an angle of 75° from the horizontal. Her paralyzed spider prey was lying venter up in the open on the wooden foundation six inches from the point where the burrow was being dug. The material in the crack was easily removed, and the wasp flung it out beneath and behind her body like a terrier digging. She emerged from the burrow occasionally to spread some of the excavated material farther from the entrance, but did not visit her prey. The cell was completed by 10:10.

After completion of the cell the wasp emerged, cleaned her antennae and legs, made an extremely brief reconnaissance trip on foot in the area around the burrow entrance, and then went to her spider. She grasped the spider at or near the base of the hind legs with the spider's abdomen beneath her, and walking backward dragged the spider toward the burrow. She left it once when halfway to the entrance and went in to examine the cell. Then she returned to the spider, again grasped it at or near the base of the hind legs and dragged it into the burrow. When the wasp reached the bottom of the burrow, she abandoned her grip on the spider's legs and, grasping it by the spinnerets, pulled it into the cell. The cell had been constructed beneath the concrete at an angle to the burrow, and about an inch below the surface. After the spider had been placed in the cell, only the apices of its legs were visible from above. The wasp remained with the spider about a minute, during which oviposition took place (as was determined later), and then came to the surface head first and scratched in some debris with her forelegs. Then, turning around, she pushed this down to the bottom of the burrow. Reversing her position again she proceeded to pound these particles down firmly with rapid blows with her abdomen. This process was repeated several times before I captured her after a plug a quarter of an inch thick had been constructed at the bottom of the burrow, and so was unable to ascertain the final details of the closure.

I dug up the spider and found that the wasp egg was 1.5 mm. long, and was securely attached to the right side of the venter of the abdomen anteriorly, parallel to the long axis of the spider's body. The spider could move its legs only very feebly at this time and also two days later, at which time it was preserved in alcohol because of failure of the wasp egg to hatch. I am indebted to B. J. Kaston for identification of this spider as a female epeirid, *Acacesia hamata* (Hentz).

A NEW HYDROPORUS FROM MICHIGAN, WITH NOTES ON OTHER MEMBERS OF THE HYDROPORUS VILIS GROUP (COLEOPTERA: DYTISCIDAE).[1]

By Frank N. Young, Bloomington, Indiana

The species of the *Hydroporous vilis* group (Fall 1923) are readily distinguished from other North American species of the genus, but present an extremely complex problem *inter se*. In effect, each local population seems to constitute a distinct or incipient species, and the isolation of populations makes it difficult to demonstrate relationships. Such a condition is an open invitation for the multiplication of names, and a detailed and systematic study of the variation within local populations must be undertaken if the confusion now found in certain other genera of the Coleoptera is to be avoided.

Most of the species are apparently stenothermic and occur only in cold springs, mountain lakes and springs, and similar situations. The anterior and middle tarsi are expanded and equipped beneath with small suction cups in both males and females, undoubtedly an adaptation for maintaining position in running water. All of the eastern North American members of the group are northern in distribution, and none has been reported south of the glaciated area.

The new species described below is superficially similar to *Hydroporus vilis* LeConte, and close to the form recorded by Blatchley as *vilis* from Vigo County, Indiana (1910). I therefore propose to name it:

Hydroporus pseudovilis n. sp.

Diagnosis: Similar to members of the western *Hydroporus vilis* complex, but smaller in size, less convex, more finely and sparsely punctate and with different male genitalia from any form known to me. Smaller and more convex, differently punctate, and with different male genitalia from *planiusculus* or *brumalis*. Larger, broader, and with narrower marginal bead on the pronotum than *terminalis, bidessoides, barbarae,* or *browni*. Total length about 2.7 to 3.2+ mm., average about 2.88 mm.

The *Hydroporus vilis* of Blatchley (1910) is apparently close

[1] Contribution No. 525 from the Zoological Laboratories of Indiana University, aided by a grant from the National Science Foundation.

to the present species, but is more reddish, the eyes are smaller in proportion, and the anterior angles of the pronotum more strongly curved inward. According to Blatchley (1910: 218) his specimens were "found in numbers in mud and water beneath a stone in a deep ravine five miles northwest of Terre Haute," Vigo County, Indiana, Oct. 20, 1894. Five, in poor condition, remain in his collection (Purdue University, one male with genitalia extracted).

Hydroporus planiusculus Fall was apparently described from a mixed series. Specimens determined *planiusculus* from Aweme Manitoba (J. B. Wallis and N. Criddle from W. J. Brown) are similar to the present species and may prove to be specifically identical. In the present state of the classification of the forms of the *vilis* group, however, it is thought best to base the name *pseudovilis* on a single paratopotypic series, of which specimens are available for distribution to workers or collections in need of them.

Comparison With Planiusculus: Planiusculus (concept based on topotypes from Mt. Adams, New Hampshire, elevation 3500 feet, P. J. Darlington, Jr. in MCZ) differs from *pseudovilis* as follows: Size larger, form rather depressed, and pronotum more coarsely punctate. Antennae relatively more massive, with segments 5, 6, and 7 especially broad. Anterior and middle tarsi of both males and females broader and with the claws proportionally longer and more slender. Marginal bead of pronotum relatively thicker and apparently more nearly horizontal near the apex so that it appears much broader. Sides of pronotum more nearly parallel basally and more strongly curved inward at apex. Clypeus less squarely truncate and more extended in front of eyes. Width of head compared to width of base of pronotum about in same proportions (5.1: 4.6 as 3.7: 3.3) *pseudovilis* being the smaller, but the eyes in *planiusculus* are apparently actually smaller than in *pseudovilis* (separated by about four times their diameter in *planiusculus* in contrast to less than four times their diameter in *pseudovilis*). Elytral and discal pronotal punctation finer and denser in *planiusculus*, the elytral microreticulation less evident, the surface therefore appearing more highly polished. The male genitalia differ as indicated in Figs. 1 and 2. The color differences are probably not highly significant, but all specimens of *pseudovilis* have the pronotum black with pale lateral margins and the elytra dirty yellow in contrast to the lighter, more reddish brown coloration of *planiusculus*. *Pseudovilis* is conspicuously bicolorous in life, and some teneral specimens have the bases of the elytra paler than the disk.

Paratypes of *H. brumalis* Brown from Bonne Esperance, Quebec and specimens identified as *brumalis* by W. J. Brown are very similar to *planiusculus* in size, shape, punctation, and male genitalia (see Figs. 2 and 3), but more closely resemble *pseudovilis* in color except that the pronotum is lighter, and the elytra darker (except at the base in some specimens which may be teneral).

Detailed description: Elongate oval, somewhat attenuate behind, widest at about basal third of elytra, moderately convex above. *Head:* Microreticulate and finely punctate, the punctures on vertex separated by from two to four times their diameter (punctures finer than on disk of pronotum); coarser punctures of head arranged much as in *planiusculus*. *Pronotum:* Microreticulate about as head but more coarsely punctate; punctures on disk finer than at sides or along apical or basal margins; marginal bead of pronotum moderately thick, apparently more nearly vertical at anterior angle than in *planiusculus* so that it appears narrower; side margins of pronotum regularly narrowing from the base, not sharply curved in just before apex, therefore not appearing as blunt anteriorly as in many other forms of the group. *Elytra:* Microreticulation regular and evident; punctures coarser than on disk of pronotum, many of the punctures elongate and roughly arranged in longitudinal rows; no sutural stria of coarser punctures evident, but coarser punctures forming a vague, somewhat impressed discal stria which disappears just beyond middle of elytron; pubescence not conspicuous. *Venter:* Coxal plates microreticulate and with irregularly spaced coarse punctures. Epipleurae of elytra with some coarse and irregularly spaced punctures near base. Abdominal sternites irregularly microreticulate, some of meshes elongate; punctation coarse and irregular especially on the last sternite. Protarsi in both sexes rather broad and with minute suction cups beneath. Anterior protarsal claw of male almost simple, just perceptibly thicker and shorter than the posterior claw. Mesotarsi narrower than anterior tarsi in both sexes, with the claws longer than those of the protarsi. Genitalia as in Fig. 1. *Color:* Head reddish brown, the clypeus often lighter, eyes black. Pronotum black on disk with sides narrowly yellowish brown. Elytra translucent, dirty yellow, sometimes with a darker area on postmedian area and with bases lighter in teneral specimens. Venter almost uniformly black with legs, antennae, underside of head, epipleurae at base, and underside of head yellowish to reddish brown.

Females are very similar to males except that they are usually somewhat broader and have the protarsi a little slenderer.

Variation: The series before me is relatively uniform. The largest female measures 3.23 mm. in total length; the smallest male 2.73 mm. in total length. The variation in other measurements is summarized below.

Type Material: Holótype male: Livingston County, Michigan, E. S. George Reserve near Pinckney, in cold spring in Grid G-5, June 19, 1952, collected by Irving J. Cantrall and F. N. Young. Total length 2.84 mm.; width pronotum at base 1.27 mm.; width pronotum at apex 0.92; length of prosternal process 0.38 mm.; total length from base of prosternum to apex of coxal laminae 1.27 mm. Allotype female: Same data as holotype. Total length 2.79 mm.; width pronotum at base 1.24 mm.; width pronotum at apex 0.89 mm.; length of prosternal process 0.38 mm.; total length from base of prosternum to apex of coxal laminae 1.22 mm. Paratopotypes: About 150 males and females from same locality as holotype collected in May, June, July, and August 1951–1952 and June 1953 by I. J. Cantrall and F. N. Young.

Location of Types: Holotype and allotype will be deposited in the University of Michigan Museum of Zoology at Ann Arbor. Paratopotypes will be deposited in various museums, and the collections of private individuals.

Biometrical Comparisons: Comparison of measurements of the local population of *Hydroporus pseudovilis* from the E. S. George Reserve with a mixed lot of specimens of *Hydroporus brumalis* from Quebec (Bonne Esperance, Mt. Albert and Mt. Lyall collected by W. J. Brown in Canadian National Collection) indicates that the two lots are significantly different in all body parts measured. Measurements of the two lots are tabulated below. (1) is the width of the pronotum at base; (2) width of pronotum at apex; (3) length of prosternal process plus distance to apex of coxal laminae; (4) length of prosternal process; (5) total length from tip of elytra to forward edge of clypeus. To convert to millimeters multiply 1, 2, 3, and 4 by 0.27 and 5 by 0.62.

Hydroporus pseudovilis (28 ♂ paratypes)

	1	2	3	4	5
Mean	4.657	3.354	4.679	1.443	4.660
Standard deviation	.1371	.0921	.1664	.0836	.1526
Standard error	.0259	.0174	.0314	.0158	.0288
Range	4.4–5.1	3.2–3.6	4.4–5.0	1.3–1.6	4.4–5.0

Hydroporus pseudovilis (27 ♀ paratypes)

	1	2	3	4	5
Mean	4.693	3.378	4.696	1.422	4.678
Standard deviation	.1664	.1058	.1720	.0761	.1697
Standard error	.0362	.0207	.0337	.0149	.0333
Range	4.4–5.1	3.2–3.6	4.5–5.2	1.3–1.6	4.5–5.2

Hydroporus brumalis (15 ♂ and ♀ paratypes and others)

	1	2	3	4	5
Mean	5.113	3.633	5.220	1.553	5.090
Standard deviation	.1509	.0883	.1558	.0656	.1280
Standard error	.0390	.0228	.0402	.0169	.0331
Range	4.7–5.3	3.4–3.8	4.9–5.4	1.5–1.7	4.8–5.3

Computation of t for pooled males and females of *H. pseudovilis* compared with pooled males and females of *brumalis* indicates highly significant differences between the means of all characters measured (> 0.01). Comparison of lots by graphic method of Hubbs and Perlmutter (1942) indicate equally highly significant differences.

Measurements taken on topotypic specimens of *H. planiusculus* from Mt. Adams, New Hampshire indicates slight differences from *brumalis,* but the two forms will probably be found to overlap considerably. Means and ranges are given below:

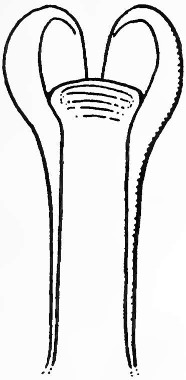
Hydroporus planiusculus (1 ♂, 3 ♀ topotypes)

	1	2	3	4	5
Mean	5.200	3.675	5.225	1.525	5.275
Range	5.1–5.4	3.6–3.8	5.2–5.3	1.5–1.6	5.2–5.5

Explanation of Plate VII

1. *Hydroporus pseudovilis* (Livingston County, Michigan); 1a. dorsal view of aedeagus (holotype); 1b. lateral view of aedeagus (holotype); 1c. external genitalia of female paratype. 2. *Hydroporus planiusculus* (Mt. Adams, New Hampshire); 1a. dorsal view of aedeagus; 1b. lateral view of aedeagus. 3. *Hydroporus brumalis* (Mt. Albert, Quebec); 1a. dorsal view of aedeagus; 1b. lateral view of aedeagus. (Drawings, all to same scale, prepared by Mr. W. L. Brudon of the Museum of Zoology, University of Michigan.)

BULL. B. E. S. VOL. XLVIII PLATE VII



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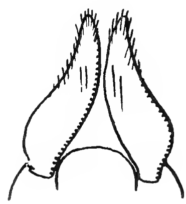
1b



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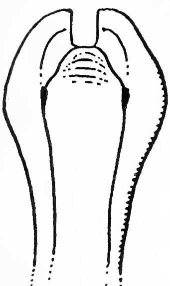
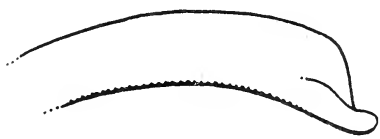


2a



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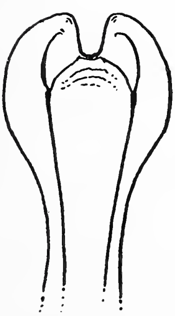
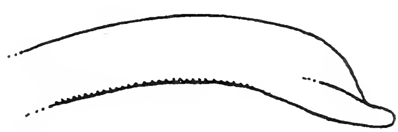


3a



3b

The principal question which arises in connection with the comparison of measurements is how much of the variation is due to environmental differences and how much to specific differences. In regard to *pseudovilis* and *brumalis* this question can be answered in part by comparison of the specimens of which the measurements overlap. In all cases of this type the male genitalia, shape of the anterior angles of the pronotum, general body shape, color, and punctation correspond to those of the local population. In other words, large *pseudovilis* resemble small *pseudovilis* more closely than they do the smaller specimens of *brumalis* or *planiusculus*. I believe, that the biometrical characters will prove to be characteristic of the populations concerned independently of ecological differences in habitat, and when sufficient local populations are known can be used in connection with other characters to deduce degree of isolation, lines of migration, and other relationships.

The measurements treated here were selected from a larger number made as a test. Those selected were found to be most easily taken and subject to the least error in measurement. All measurements were made with an ocular micrometer in a binocular dissecting microscope with magnification of about 43 diameters. Many of the measurements were checked several times and comparable figures should be obtainable by any worker.

I wish to thank Dr. Saul B. Saila and Dr. W. R. Breneman for suggestions and help with the statistical tests. Thanks are also due Dr. W. J. Brown and Dr. P. J. Darlington, Jr. for the loan of specimens.

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NOTES ON LISTRONOTUS DEBILIS BLATCHLEY (COLEOPTERA, CURCULIONIDAE).

By DONALD M. TUTTLE[1], Urbana, Illinois.

Following the description of this weevil by Blatchley (Blatchley and Leng, 1916) a brief note by Henderson concerning its biology appeared in 1939. The information which appears below is largely a result of observations made by me during the summers of 1949–1951 near Urbana, Illinois.

Previously this species had been recorded only from Indiana (Blatchley and Leng, 1916) but we know now it extends southeast through Maryland and the District of Columbia to Virginia, and southwest through Illinois, Kansas, and Oklahoma (Henderson, 1939). Specimens collected in Illinois were taken at Mayview, a small village located four miles east of Urbana.

Henderson (1939) remarks that the food plant of this weevil is unknown. The writer discovered this beetle feeding abundantly in the lower stems and the roots of the water willow, *Dianthera americana,* family Acanthaceae, in Illinois. The stems of this plant are rather weak and tend to be square towards the roots. During July these semi-aquatic plants bear dark blue flowers. Perhaps one of the most remarkable associations between plant and weevil in this case is the development of the weevil below the surface of the water but within the plant. The root system of the plant is extremely fibrous and the main roots break easily. In order to secure the lower stems and root in which the weevil was to be found, it was necessary to dig down with a sharp instrument such as a trowel. Even so, the root system was often cut off too short and only the upper tunnel of the larva was found.

Adults were dissected from the roots of the water willow from July 18 to September 17. During this same period several adults were reared from both larvae and pupae. Since adults occur late in the season and leave the stems, it is likely that they pass the winter in protected places near the water. Blatchley and Leng (1916) report their occurrence in Indiana between June 12 and July 1. No doubt these were overwintering adults. An earlier record of this species occurring in Illinois was an adult taken by Frison at a light on June 12 at Oakwood, Illinois (Henderson, 1939). From these records it appears possible that adults might be found any time of the year.

[1] Now Research Entomologist at the University of Arizona.

The act of oviposition has never been actually observed although egg punctures are easily distinguished on the stems just above the surface of the water. It is at this point that the beginnings of the larval tunnels occur and extend downward through the center of the root.

Larvae were dissected from the roots from August 22 to September 11. These whitish larvae are elongate and when mature measure 6–7 millimeters in length. By cutting through the stems the origin of the larval tunnel was observed slightly above the water line. The larvae are always located farther into the roots than either the pupae or the adults. Mature larvae turn about and eat upwards toward the surface of the water. The pupal cavities which are formed near the surface of the water are blocked off with coarse frass or stem fibers chewed off but not digested. The same habit of larvae working upward in aquatic or semiaquatic plants has also been noted for other species of weevils.

Pupae are white when newly transformed but in a few days the appendages become darker in color. At the end of 8–10 days the general body color is brown. On September 11, three larvae and one pupa were dissected from the roots of water willow. The three larvae which were reared to the adult stage had a pupal period of 10–14 days. A few exit holes in the stems of water willow were examined on August 18. These irregular exits measured 2.5–3.0 mm. in diameter.

Four specimens of a Braconid parasite of this weevil were determined by C. F. W. Muesebeck, of the Division of Insect Detection and Identification, BEPQ, USDA, as, *Microbracon punctatus* Mues. Two of these parasites were reared from cocoons found in the stems of water willow in 1950. The other two were reared from the larval hosts during September 1951. Apparently, the parasite attacks weevil larvae that have nearly reached maturity. This case of parasitism is rather interesting since the larvae of the weevils are usually a few inches below the waterline in the roots of the aquatic plant. Hence, it appears that the female parasite deposits her eggs in the egg puncture of the weevil and the larva crawls down into the burrow to attack the host.

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UTAH INSECT NOTES.

By George F. Knowlton, Logan, Utah.

Hermetia chrysopila in Utah: Reporting on a recent shipment of Utah Stratiomyiidae which he had identified, Dr. M. T. James called attention that the record of *Hermetia chrysopila* Lw., Salt Lake City, June 17, 1951, was a new state record for Utah.

Platypalpus ochricollis Mel.: Five specimens of Empididae, Diptera, were collected at American Fork, Utah, September 23, 1952, in a celery field. These were identified by Dr. W. W. Wirth, with a note "New to U.S.N.M. coll." The specimens were retained at the National Museum.

Fabriciella latifacies Tothill on rabbit brush: This large tachinid fly was extremely abundant on rabbit brush, *Chrysothamnus nauseosus, C. viscidiflorus* and their subspecies and varieties, practically everywhere I stopped my car to sweep upon this blossoming plant, on one trip I made to the Uinta Basin. It was not unusual to capture 5 to 8 specimens in one sweep of a standard insect net. I took a maximum of 17 specimens in one sweep. Locality labels dated August 24, 1948, revealed a great many specimens to have been taken for miles, from Strawberry Reservoir west, to Fruitland, and as far as Duchesne, in Utah. On the preceding day, specimens had been numerous on blossoming rabbit brush at Duchesne, and far from scarce at LaPoint, Myton and Tridell. Other Tachinidae taken with the *F. latifacies* included a good series of *Ptilodexia* at Fruitland and Duchesne, and a species of Sarcophagidae, *Senotainia flavescens* Townsend, at LaPoint, also taken on rabbit brush on the above dates. The flies were identified by Professor H. J. Reinhard.

Western harvester ant stores Mormon cricket bait: The day of June 5, 1952, was devoted to a study of Mormon cricket outbreak areas in Tooele County, Utah. Under the guidance of U. S. Department of Agriculture entomologist H. F. Thornley, Dr. D. M. Hammond, Dr. G. E. Bohart, Dr. E. J. Gardner, Seth Parkinson and I first visited the bait mixing station at Benmore. Here 80 tons of rolled wheat and 20 tons of large-flake bran had been mixed at the rate of ½ pound chlordane and ½ gallon of fuel oil in each 100 pounds of rolled wheat or bran. A continuous mixer was set up here. The mixed bait was applied to the infested range land by means of a large airplane. In this area, 28,025 acres of range and planted pasture land were baited. Five pounds of bait

to the acre were applied for ordinary infestations. Our next stop was made along Bennion Creek, south of the bait mixing station. This was an area where the Mormon crickets had repeatedly migrated in. The plane had baited this area several times, resulting in a heavy kill of crickets. One thing besides the dead Mormon crickets attracted my attention. Western harvester ant foragers were observed to be very scarce in this re-baited area on both sides of the creek. The few ants moving over the denuded areas about the nests generally lacked normal coordination. Ant nests were common here as elsewhere over the county. All ant hills "kicked over" where repeated baiting had occurred showed quite a lot of the chlordane treated wheat flakes to be present, stored in the upper tunnel chambers. In a few cases, quite a lot of dead harvester ants also were observed in nearby tunnels. It seemed evident that the wheat-chlordane bait had been hauled in by the field workers. Feeding upon or contact with this had to a large extent wiped out the field force of ants. Digging more deeply into a few nests suggested that the colonies as a whole had been greatly weakened. No such weakness of colonies, nor loss of field force, was noted elsewhere in the area, although small amounts of bait likely had been brought in by colonies existing in the lightly baited areas.

Daddy-long-legs feeding observations: On the evening of August 24, 1952, F. V. Lieberman and I spent a part of the evening, from 7:00 to 7:30 p.m. (Mountain Standard Time), picking up freshly dead honey bees in front of sixteen hives which were located on the North Logan Experimental Farm, near a blossoming alfalfa field. Eighteen of the dead bees were being fed upon by daddy-long-legs. In front of one of the hives, seven of the dead bees were being eaten by these long-legged scavengers. When disturbed, one specimen picked up its food and tried to run beneath a hive. This phalangid was captured and the bee it carried was carefully examined. It proved to be headless and very light in weight. This was the only headless or desiccated bee observed to be fed upon that evening. Nearly all of the bees were freshly dead, as a rather thorough pickup of dead bees had been made here at 6:00 to 6:40 a.m. that same morning by W. P. Nye. In addition to the feeding on bees, one phalangid was feeding on a recently dead sarcophagid fly, *Sarcophaga ehermineiri* Desv. (Det. Dr. C. H. Curran). Two days later, at the regular 6:00 a.m. pickup, Mr. Nye, M. D. Levin and I observed several additional daddy-long-legs which were feeding on recently dead bees. Also,

I found one which was attacking a bee which was still able to kick weakly.

At Salt Lake City, on the Mormon temple grounds during August of 1952, daddy-long-legs were found to be rather numerous on and about fine old elm trees some of which were 60 to 75 years old. Two of the daddy-long-legs were observed to be feeding on dead elm leaf beetle larvae, *Galerucella xanthomelaena* (Schrank), and another on a recently dead pupa of this elm beetle. All Phalangida specimens collected were identified by Dr. W. J. Gertsch as *Phalangium opilio* L.

The corn earworm in Utah: A large infestation of corn earworm larvae, *Heliothis armigera* Hausman, were found to be highly destructive to alfalfa blossoms in one large alfalfa seed field at Milford, Utah, during mid-July of 1952. This unusual infestation and the associated crop damage was called to the writer's attention by the County Agricultural Agent, Grant M. Esplin. The worms ate off the alfalfa blossoms to such an extent that seed production prospects were greatly reduced. This is the largest population of corn earworm larvae feeding on alfalfa with which the writer has had experience in Utah. During the latter half of July, August and early September, large numbers of corn earworm moths were encountered in blossoming alfalfa seed fields in many parts of Utah. These moths were conspicuously numerous in an alfalfa seed field being intensively studied in North Logan, from late July until September 3. In one instance, nine of these moths were counted in making an examination of fifty staked-out 1-square yard observation stations in this blossoming field. This count was made between 10:00 and 11:00 a.m. In three of the instances, two moths were present on the same measured one-square yard area. At Logan during late September and October, corn earworm larvae were found to be common and seriously damaging inside gladiolus seed pods in the fine large gladiolus garden of Dr. Wallace J. Vickers. At one observation date, no uninfested pods were observed. 1952 was a year of uncommonly severe and extensive corn earworm infestation in corn tassels and ears, in tomato fruits, and occasionally in bean pods and other crop plants throughout Utah.

Nabis alternatus prey: An unusually large population of the leafhopper, *Dikraneura carneola* (Stal), was encountered causing tiny-spot leaf discoloration injury to alfalfa at Erda, Utah, on October 22, 1952. In one of the insect-net sweepings made, a male damsel bug, *Nabis alternatus* Parsh, was observed to be feeding

on a female of this abundant leafhopper. In a field of celery at Midvale, Utah, on September 19, 1952, a nymphal *Nabis alternatus* had been observed to have a winged *Thrips tabaci* Lind. impaled on the end of its rostrum. This damsel bug also was found among material swept up in an insect net. In a celery field at Farmington, Utah, on October 10, 1952, an adult *N. alternatus* female was observed to be resting on a leaf of a celery plant while feeding on a nearly-dead 6-spotted leafhopper, *Macrosteles divisus* (Uhl.), which it held with its front legs. This damsel bug is a common and economically important predator on the pea aphid, *Macrosiphum pisi* (Kalt.), in Utah alfalfa and pea fields.

Additional Record of Phoresy of Mallophaga on Hippoboscidae: While collecting Mallophaga on a feral pigeon (*Columba livia* Gmelin), on August 15, 1952, from the eaves of the Zoology Building of the University of Chicago, the author noted two hippoboscids, *Pseudolynchia canariensis* (Macquart). One of them, a female, had a male and a female of *Columbicola columbae* (Linné) attached by the mandibles to the left second femur. The bird was heavily infested (300 to 400 lice) with this Mallophagan specific of domestic pigeon. This is the second North American record of the association, a previous case having been noted by Martin (1934, *Canad. Ent.*, 66: 6–16) in Texas. Dr. Bequaert informs me that *P. canariensis* has been reported from Chicago once before by MacArthur (1948, *Bull. Publ. Mus. Milwaukee,* 8, p. 430), but without host, and that Chicago is at the extreme northern range of the fly which seems to be extending its range.—Ronald A. Ward, Chicago, Illinois.

PUBLICATIONS RECEIVED

The Social Insects, by O. W. Richards. 219 pp., 12 textfigures and 50 photographs. 5 × 8 ins., cloth bound. 1953. Philosophical Library, Inc. New York. (Price, $4.75.)

How to Know the Spiders, by B. J. & Elizabeth Kaston. 220 pp., 552 textfigures. 5½ × 8½ ins., spiral bound paper cover. 1953. Wm. C. Brown Company, Dubuque, Iowa. (Price, $2.25.)

THE OCCURRENCE OF *ORTHOPODOMYIA ALBA* BAKER IN GEORGIA (DIPTERA: CULICIDAE).

By WILLIAM D. SUDIA and RUTH H. GOGEL, Atlanta, Georgia.

The only previous published record of the rare tree-hole mosquito, *Orthopodomyia alba* Baker, from Georgia is that of Carpenter, et al. (1946), who base their record on an adult female and one other adult, sex unknown, from Liberty Field (Sub-base), Camp Stewart, Hinesville, Ga., on June 27, 1944. The female was taken in a light trap and the other adult from a resting station. Since Jenkins and Carpenter (1946), Ross (1947), and others have indicated that adults of *Orthopodomyia signifera* (Coq.) cannot be separated from *O. alba* with any reliability, this record must be regarded as questionable. Schoof and Ashton (1944) apparently misquoted the Shields and Miles (1937) paper when they stated that "*alba* has been recorded from one southern state, Georgia." The actual collection was made in Colbert County, Ala., instead of in Georgia.

Jenkins and Carpenter suggested that "It is possible that *O. alba* is a genetic variant, or that it is a well-marked and distinct extreme of the natural variation of *O. signifera*." Dodge (1946) noted that the first instars of these two species are distinct, and Wilkins and Breland (1951) have shown that there were sufficient characters to separate them in all other larval instars. Wilkins and Breland concluded from their studies that specific status should be maintained for *O. alba*. Darsie (1951) stated that "the pupal chaetotaxy offers many good characters to support their specific rank."

Bohart (1950) lists the most reliable characters for separating the three United States species of *Orthopodomyia: alba, signifera,* and *californica* Bohart.

In 7 years (1946 to 1953) of collecting in Atlanta, Ga. and vicinity by members of the Medical Entomology Unit of the Communicable Disease Center, only one larva of *O. alba* has been found up to the present time. This larva was collected by C. Phillips, S. Darby, and C. Bird on November 6, 1947 from an elm tree. On March 25, 1953, the authors found another elm tree about four blocks from the State capitol buildings in downtown Atlanta from which over 1,100 *O. alba* were taken. Only seven *O. signifera* were found. The tree hole was quite large and open and contained approximately 1½ gallons of deeply stained brownish-yellow water. The pH of this water was 8.6. Another elm tree hole containing

about 2 quarts of water was located about 20 feet from the first; however, surprisingly enough, it contained no larvae of any kind. The pH of this water was 8.49, and the color was a much lighter brown.

Of the seven *O. signifera* taken, six larvae had dorsal plates on segment VIII only, and only one larva had plates on segments VII and VIII. However, they exhibited the characteristic pinkish body color and dark head capsule while the *O. alba* all exhibited the characteristic whitish body color and the light head capsule.

Since the number of larvae taken was unusually high for the species, sufficient material is being prepared for a further investigation into the variations of characters of this species.

In two feeding experiments on a baby chick, the adult females showed extreme reluctance to take a blood meal. They did not approach the chick readily, and when they did, they were easily disturbed. On the third and fourth attempts, the chick was allowed to remain adjacent to the cage over night, and fastened in such a manner as to reduce movement to a minimum. In each case, several females were observed to have had a blood meal. Several females were crushed on a glass slide and stained. Examination of the crushed mosquito revealed nucleated avian blood cells. The remaining females died before any oviposition occurred.

Acknowledgment

The authors wish to acknowledge the assistance of Dr. Harry D. Pratt, Sr. Scientist, Communicable Disease Center, Atlanta, Ga.

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POGONOMYRMEX SALINUS OLSEN, A SYNONYM OF POGONOMYRMEX OCCIDENTALIS (CRESS.) (HYMENOPTERA: FORMICIDAE).

By Marion R. Smith, Washington, D. C.

Recently in determining a series of *Pogonomyrmex* workers collected by Lee M. Burge from five colonies in Elko County, Nevada, I found that in the keys of Creighton, 1950 (Harvard Univ., Bull. Mus. Compar. Zool. 104: 565 pp., 57 pls.) and Olson, 1934 (Harvard Univ., Bull. Mus. Compar. Zool. 77: 493–514, 15 pls.) specimens exhibiting the most extreme variation could be referred to *salinus* Olsen and specimens with the least variation to *occidentalis* (Cress.)! Upon checking these individuals with the original description of *salinus* I found the variations to be of such a nature that they could well be within the range of a single species. Since Olsen had described *salinus* from a holotype worker, which is now in the Museum of Comparative Zoology, Cambridge, Massachusetts, I sent series of workers from all five of the Elko County nests to Dr. W. L. Brown for comparison with the type of *salinus.* After carefully studying the specimens Dr. Brown wrote me as follows, "Olsen's *P. salinus* agrees well with certain specimens among your series—i.e., those having an almost entirely non-transverse-rugose postpetiole and slender, upwardly-directed propodeal teeth of "medium" length. The basigastric shagreening in Olsen's type is not so strong or opaque as in several of your Nevada specimens. I would conclude that on the basis of

the present evidence, *P. salinus* is a straight synonym of *P. occidentalis*." Olsen's single individual of *salinus* represents a considerably advanced degree of variation but one well within the specific range of *occidentalis*.

Studies of various collections of *P. occidentalis* from over a wide range are beginning to indicate that the species is more highly variable than we first thought. At this time, the western harvester ant is known to occur from British Columbia to Oregon and from North Dakota to Oklahoma. Two distributional records are not included in that range although it is possible they are correct. One of these is Weed, Siskiyou County, California, A. C. Cole, and the other Sioux City, Iowa, C. N. Ainslie. The former locality is in northern California and the latter in extreme western Iowa.

Below is a chronological list of the various synonyms of *occidentalis*.

Pogonomyrmex occidentalis (Cresson)

Myrmica occidentalis Cresson, 1865, Proc. Ent. Soc. Phila. 4: 426. *Worker, female.* Colo., no specific locality known; types in Academy of Natural Sciences of Philadelphia.

Myrmica seminigra Cresson, 1865, Proc. Ent. Soc. Phila. 4: 427. *Male.* Colo., no specific locality known; types in the Academy of Natural Sciences of Philadelphia.

Pogonomyrmex opaciceps Mayr, 1870, Verh. Zool.-Bot. Gesell. Wien. 20: 971. *Worker.* New Mex., no specific locality known, collected by Norton; types presumably in the Natural History Museum, Vienna, Austria.

Pogonomyrmex occidentalis ruthveni Gaige, 1914, Proc. Biol. Soc. Wash. 27: 93. *Worker, female, male.* James Canyon in Elko County, Nev., collected by F. M. Gaige; types in Museum of Zoology, University of Michigan (catalogue number 2283).

Pogonomyrmex salinus Olsen, 1934, Harvard Univ., Bull. Mus. Compar. Zool. 77: 498, 510. *Worker.* Pl. 5, fig. 3. Near Soda Springs, Bridgeport, Calif., collected by E. C. Jaeger; holotype in the Museum of Comparative Zoology, Cambridge, Mass. New synonymy.

CONTENTS

(Arranged alphabetically throughout)

Coleoptera

Collembola

Diptera

General Subject

HETEROPTERA

HOMOPTERA

HYMENOPTERA

LEPIDOPTERA

Other Orders and Other Animals

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INDEX TO VOLUME XLVIII

Arranged alphabetically throughout; valid species in Roman type, new species and other forms in boldface. ø indicates other animals; * plants.

Number of New Forms in this Index—45.

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This page is limited to exchange notices and to small For Sale advertisements from members of the Society and from actual paid subscribers to the Bulletin exclusively. *Exchange notices* from members of the Society and from subscribers are limited to *three (3) lines each,* including address; beyond 3 lines, there will be a charge of $1.00 for each 3 lines or less additional. *For Sale* ads will be charged at $1.25 for each 3 lines or part of 3 lines. *Commercial or business* advertisements will not be carried in this page, but will go in our regular advertising pages at our regular advertising rates to *everybody.*

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WANTED—Psyche, vols. 11, 13, 15; Trans. Amer. Ent. Soc., vols. 1–5. C. F. dos Passos, Mendham, New Jersey.

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Genus Baccha from the New World, Hull. 102 pp., 47 plates. 1947 .... $ 3.00

The Scutate Ticks, Or Ixodidae, Of Indonesia, Anastos. 144 pp., 28 figures. 1950. .... $ 5.00

Tingoidea of New England and Their Biology, Bailey. 122 pp. 1951. .... $ 5.00

The Hippoboscidae or Louse-Flies of Mammals and Birds, Part I. Structure, Physiology and Natural History, Bequaert, 442 pp., 21 figs., 1952–53. .... $10.00
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CONTENTS

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BULLETIN

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WASPS COLLECTED AT LOST RIVER STATE PARK, WEST VIRGINIA IN 1953 (HYMENOPTERA, ACULEATA).

By Karl V. Krombein, Arlington, Virginia.

A couple of years ago I presented (Krombein, 1952, Proc. Ent. Soc. Washington 54: 175–184) a preliminary annotated list of the wasps of Lost River State Park, Hardy County, West Virginia based on collections made from June 18–25, 1951 and on July 12, 1951. Seventy-eight species were recorded in that list, 42 of them common to both the Transition and Upper Austral Zones, 15 chiefly Transition (or Transition and Canadian) in distribution, 12 predominantly Austral, one from the Canadian Zone, and the other eight known from too few localities to permit reference to a particular zone. Four of the species were included in that list on the basis of sight records of individuals or of their typical nests.

Last year I was again able to spend a week, June 29 to July 5, 1953, in the park in the same cabin as in 1951. An annotated list of the species captured during 1953 is presented below. A total of 79 species was collected, but of these 24 were not collected in 1951, so the number of wasps now known from the park stands at 102 species. The species new to the park list are marked by an asterisk. The four sight records included in the 1951 list were confirmed by the actual capture of specimens in 1953. Of the 24 species collected for the first time in 1953, 12 are representatives of the Transition and Upper Austral Zones, six are predominantly Austral in distribution, three are members of the Transition or Transition and Canadian Zones, and the other three are known from too few localities to permit a zonal reference.

About 60 wooden trap nests were set out around the cabin at heights varying from 1 to 8 feet above the ground, and with the

burrows horizontal to the ground. These nests were constructed of straight-grained pine blocks about 4½″ × ¾″ × ¾″, each with a drilled burrow about 3½″ in length and ¼″, ⅛″ or 1/16″ in diameter. They were set out on June 29th, but a week later only a disappointingly small number had been used, although many wasps were nesting in the wooden logs forming the cabin walls.

I am indebted to the following specialists for identifications of prey of several of the wasps discussed herein: W. H. Anderson (larval Coleoptera), H. W. Capps (larval Lepidoptera), B. J. Kaston (Araneae), Miss L. M. Russell (Homoptera), and G. B. Vogt (adult Coleoptera).

Tiphiidae

Tiphia micropunctata Allen; 2 males; July 3 and 5; along trail in sun.

Myrmosa (*Myrmosa*) *unicolor* Say; 2 males; June 30 and July 3; along trail in sun.

Mutillidae

Pseudomethoca f. frigida (Sm.); 1 female; July 3; along trail in sun.

**Pseudomethoca simillima* (Sm.); 1 female; July 5; along trail in sun.

**Dasymutilla nigripes* (F.); 1 female; July 5; along trail in sun.

**Ephuta conchate* Mick.; 1 female; July 5; along trail in sun.

Vespidae

Vespula (*Vespula*) *maculifrons* (Buyss.); 1 queen and 1 worker; July 4.

Vespula (*Vespula*) *rufa vidua* (Sauss.); 4 queens; June 29–July 5.

Vespula (*Vespula*) *vulgaris* (L.); 5 queens; June 29–July 6.

Vespula (*Dolichovespula*) *a. arenaria* (F.); 1 worker; July 2.

Vespula (*Dolichovespula*) *maculata* (L.); 3 workers; July 1–4.

**Polistes annularis* (L.); 2 females; July 2 and 4.

Polistes fuscatus pallipes Lep.; 5 females; July 1–3.

Rygchium f. foraminatum (Sauss.); 1 female, 7 males; June 30–July 4; mostly in open woods.

Ancistrocerus t. tigris (Sauss.); 4 females; June 30–July 4; mostly in open woods.

Two females of this species stocked cells in wood block trap nests containing drilled burrows one-quarter of an inch in diameter. One of these nests (7253 D) had been placed on a window sill of the cabin 4 feet above the ground with its entrance to the south.

The female wasp was first noticed at 4 p.m., E. S. T., on July 4th peering inside the burrow entrance. Fifteen minutes later she drove off a miltogrammine fly and then disappeared. By 5:30 p. m. she had plugged the entrance with damp clay. This nest was split open on July 17th. It contained a single cell at the end of the burrow with an entirely pale wasp pupa with its head toward the burrow entrance. There was a partial cocoon of white silk covering the anterior third of the pupa. There were no prey remains. The cell was 21 mm. long and above it was a clay partition 2 mm. thick. The remainder of the burrow was empty except for the thin clay cap across the entrance. A female wasp had emerged from the cell by August 1st.

The second wasp (7453 C) had selected a trap nest on a window sill 5 feet above the ground with the entrance facing the west. The cell contained five paralyzed lepidopterous larvae at 6 p.m. on July 4th. The female wasp was in the burrow at 9 p.m. that evening with her head an inch from the entrance. A strip of adhesive tape was placed across the entrance on the following night to secure the female for identification. The nest was split open on July 17th and contained the dead mother wasp near the entrance and one cell at the bottom sealed with a very thin clay partition. The cell plus partition was 10 mm. long and contained the following prey fragments—seven larvae of one species of Olethreutidae, one gelechiid larva, and four lepidopterous head capsules. In addition there were four dipterous puparia 5 mm. long and 1.5 mm. wide.

Symmorphus canadensis (Sauss.); 13 females, 20 males; June 30–July 5; mostly in open woods or hovering before burrow entrances in logs of cabin walls.

One female (7253 B) was captured hovering before her burrow entrance carrying a paralyzed chrysomelid larva at 1 p.m. on July 2nd. The larva, *Chalepus dorsalis* Thunb., a leaf miner in locust, was nearly full grown.

Stenodynerus (Parancistrocerus) p. pedestris (Sauss.); 2 females, 1 male; June 30–July 4.

Stenodynerus (Parancistrocerus) p. perennis (Sauss.); 2 females; July 2 and 5; in open woods.

Pompilidae

Chirodamus albopilosus (Cr.); 3 females; June 29 and July 3; in open woods.

**Chirodamus fortis* (Cr.); 1 female; July 3; in open woods.

**Priocnessus dakota* (Cr.); 1 female; July 4; along trail in sun.

**Priocnessus nebulosus* (Dahlb.); 2 females; July 3 and 4; in open woods.

Dipogon (*Deuteragenia*) *s. sayi* (Cr.); 1 female; July 2; in open woods.

Priocnemis (*Myrmecosalius*) *germana* (Cr.); 9 males; July 2–5; in woods.

Priocnemis (*Myrmecosalius*) *scitula relicta* Bks.; 1 female, 8 males; June 30–July 5; on low vegetation along trail in shade.

Calicurgus hyalinatus alienatus (Sm.); 3 males; June 30–July 4; in or at edge of open woods.

**Auplopus architectus* (Say); 1 female; July 2; around cabin in open woods.

Auplopus mellipes (Say); 1 female; June 30; in cabin.

Auplopus nigrellus (Bks.); 16 females, 3 males; June 30–July 5; in dense to open woods.

One female (7253 C) was captured while she was dragging a paralyzed spider over the ground along the edge of a trail at 2 p.m. on July 2nd. All the spider's legs beyond the coxae had been amputated. The spider was a female anyphaenid, *Anyphaena fraterna* Bks.

**Ageniella* (*Ageniella*) *conflicta* Bks.; 1 female; July 1; walking over slope of gravelly soil along trail in sun.

**Ageniella* (*Ageniella*) sp.; 1 male; June 30; on slope of gravelly soil along trail in sun.

**Aporus* (*Aporus*) *niger* (Cr.); 1 male; July 3; in woods.

Allaporus rufiventris (Cr.); 1 female, 2 males; July 3 and 5; on slope of gravelly soil along trail in sun; a second female was captured but escaped.

Psorthaspis mariae (Cr.); 4 females; July 3–5; hunting on slopes of gravelly soil along trail in sun.

**Evagetes padrinus minusculus* (Bks.); 1 female; July 5; on slope of gravelly soil along trail in sun.

**Agenioideus* (*Agenioideus*) *humilis* (Cr.); 1 female, 4 males; June 30–July 5; mostly around cabin foundations in open woods.

**Anoplius* (*Lophopompilus*) *carolina* (Bks.); 9 females, 16 males; June 30–July 5; in dense to open woods, or at edge thereof.

Anoplius (*Pompilinus*) *marginatus* (Say); 3 females; June 30–July 3; along trail and in open woods.

Anoplius (*Pompilinus*) *r. rectangularis* (Dreis.); 1 male; July 5; along trail.

**Anoplius* (*Pompilinus*) *splendens* (Dreis.); 2 males; July 1 and 2; along trail.

Anoplius (*Anoplius*) *virginiensis* (Cr.); 6 females, 16 males; June 29–July 5; in dense to open woods.

Pompilus (*Arachnospila*) *arctus* Cr.; 1 male; July 1; in open woods.

Pompilus (*Anoplochares*) *apicatus* Prov.; 5 females, 7 males; June 30–July 4; in dense to open woods.

**Aporinellus completus* Bks.; 2 females, 1 male; June 30 and July 2; on slope of gravelly soil along trail in sun; a female of this species was recorded erroneously as *fasciatus* (Sm.) in my earlier paper.

Sphecidae

**Trypoxylon* (*Trypoxylon*) *carinatum* Say; 1 female; July 5; around cabin in open woods.

Trypoxylon (*Trypoxylon*) *frigidum* Sm.; 8 females, 10 males; June 30–July 5; in open woods, and entering burrows in logs of cabin walls.

Trypoxylon (*Trypoxylon*) *pennsylvanicum* Sauss.; 1 female; July 4; around cabin.

Trypoxylon (*Trypoxylon*) *richardsi* Sandh.; 2 males; July 2 and 3; around cabin and in open woods.

Trypoxylon (*Trypargilum*) *politum* Say; 1 female; July 2; around cabin.

**Trypoxylon* (*Trypargilum*) *rubro-cinctum* Pack.; 7 females; July 1–4; in open woods and around cabin walls.

A female (7453 B) and male were first noted nesting in one of the wooden block trap nests with a diameter of a quarter of an inch on July 4th. The nest they used had been set out on a window sill 5 feet above the ground with the entrance to the east. The male of this species stands guard just inside the nest entrance while the female is hunting for prey. I saw the female return once with a spider on July 5th. After identifying her as she came to the entrance, the male emerged, climbed on her back and entered the burrow with her. The entrance to this nest was taped shut at 9 p.m. on July 5th. The block was split open on July 17th and contained the dead female near the entrance and ten small paralyzed or dead spiders at the end of the burrow, but no wasp egg or larva—apparently the first cell had not been completely stocked when I sealed the nest. Most of the spiders were still fresh, and a few were capable of reflex movements of their legs. The spiders were all epeirids, and consisted of seven immatures, and one female each of *Theridion murarium* Em., *T. lyra* Hentz, and *T. alabamense* Gertsch and Archer.

Trypoxylon (*Trypargilum*) *striatum* Prov.; 2 females; July 1; gathering clay in a shaded spot along trail.

Psen (*Psen*) *monticola* Pack.; 7 females, 4 males; June 30–July 5; in open woods or at their edge.

**Psen* (*Pseneo*) *k. kohlii* Fox; 3 females; July 2 and 3; in open woods.

Mimesa (*Mimumesa*) *nigra* (Pack.); 1 female; July 2; hovering before cabin wall.

**Pemphredon* (*Cemonus*) *tenax* Fox; 5 males; June 30 and July 4; in open woods.

Stigmus (*Stigmus*) *americanus* Pack.; 6 females, 14 males; June 29–July 5; mostly hovering before burrow entrances in cabin walls, a few at edge of open woods.

One female (7253 A) was taken at 10 a.m. on July 2nd hovering before her burrow entrance in the cabin wall. She was carrying a paralyzed aphid nymph belonging to the tribe Panaphini in her mandibles.

Passaloecus annulatus Say; 1 female; July 1.

Passaloecus mandibularis (Cr.); 1 female; July 2; around cabin walls.

Passaloecus relativus Fox; 6 females, 1 male; June 29–July 5; hovering before cabin walls.

Spilomena ampliceps Krom.; 1 female; June 29; crawling on log in cabin wall.

Spilomena pusilla (Say); 1 female; July 5; hovering before cabin wall.

Sphex arvensis (Dahlb.); 2 females, 2 males; July 1–3; around cabin and along trail.

Chalybion californicum (Sauss.); 1 female; July 4; around cabin.

**Nysson* (*Nysson*) *simplicicornis* Fox; 13 females, 1 male; June 30–July 5; along trail in sunny areas.

Nysson (*Nysson*) *subtilis* Fox; 14 females, 1 male; June 30–July 5; along trail in sunny areas and around cabin.

**Ochleroptera bipunctata* (Say); 1 female; July 5; around cabin.

Gorytes (*Gorytes*) *simillimus* Sm.; 1 male; July 4; in open woods.

Cerceris clypeata Dahlb.; 4 females, 4 males; June 30–July 5; along trail in sunny areas.

One female (7353 A) was captured with her paralyzed beetle prey at 1:30 p.m. on July 3rd as she started to enter her burrow

in gravelly soil along a trail. The beetle was an adult chrysomelid, *Chalepus dorsalis* Thunb. The burrow, when excavated, was found to be almost perpendicular and 3 inches deep. It did not contain any beetles.

**Euplilis* (*Corynopus*) *coarctatus* (Scop.); 1 male; July 4; in open woods.

Crossocerus (*Crossocerus*) *lentus* (Fox); 1 female; July 4; along edge of trail in sunny area.

Crossocerus (*Crossocerus*) *similis* (Fox); 2 females; July 2 and 3; around cabin.

Crossocerus (*Blepharipus*) *ambiguus* (Dahlb.); 1 male; July 5.

Crossocerus (*Blepharipus*) *harringtonii* (Fox); 2 females; July 3 and 4; in open woods.

Crossocerus (*Blepharipus*) *impressifrons* (Sm.); 2 females, 2 males; June 29–July 3; hovering before cabin walls in open woods.

**Crossocerus* (*Blepharipus*) *nigricornis* (Prov.); 1 female; July 2; in open woods along trail.

Crossocerus (*Blepharipus*) *tarsalis* (Fox); 1 male; July 3; in open woods.

Ectemnius (*Clytochrysus*) *nigrifrons* (Cr.); 2 females; July 1 and 3; in open woods.

**Ectemnius* (*Ectemnius*) *corrugatus* (Pack.); 3 males; June 30; in open woods.

Lestica (*Solenius*) *producticollis* (Pack.); 2 females; June 30 and July 2; in open woods.

On the larva of Lytrosis unitaria.—In the June 1953 number of the Bulletin appeared an article by Mr. Joseph Muller, describing the larva of *Lytrosis unitaria* and giving the food plant as pin oak. During the course of over fifty years of collecting, I have repeatedly taken males of this species at light, but have never been fortunate enough to capture a female. However, on May 18, 1941, while beating thorn apple for Catocala larvae, I captured a fine large Geometrid larva. This fed to maturity and pupated about June 1st.

The moth emerged June 7, 1941, a nice female of *unitaria*. So thorn apple or hawthorn may be recorded as another food plant for this species.—Alex K. Wyatt, Chicago, Illinois.

CAPITOPHORUS AND AMPHOROPHORA APHID NOTES.

By George F. Knowlton, Logan, Utah

Many of the following records are based on identifications recently made by Professor M. A. Palmer. The aphid names used, in general, follow her 1952 book—"Aphids of the Rocky Mountain Region."

Capitophorus braggi (Gillette). On *Eleagnus angustifolia* and *E. canadensis* at Logan, Utah, October 1950 (Knowlton—E. H. Kardos); on Russian olive at Lone Deer and Plerna, Montana, October 1941 (H. F. Thornley); alates on celery at American Fork during September of 1951.

C. corambus H. Alate on red currant, *Ribes,* at Orem, Utah, May 27, 1938 (Knowlton).

C. fragaefolii (Cockerell). On strawberry at Ogden, Farmington and Riverheights, Utah, June 1935; in Washington at Lynden (E. Breakey), Sumas (C. H. Johansen), Puyallup (W. W. Baker, H. C. Bennion, Knowlton, C. D. Schwartz), Vancouver and Ridgefield (D. L. Bischoff); on *Rosa* at Choteau, Montana, July 23, 1946 (Knowlton); and *Rosa woodsii* in Logan Canyon, Utah, July 3, 1938 (Knowlton—W. P. Nye) and Mt. Alice, Utah, June 24, 1946 (Knowlton).

C. frigidae Palmer. On *Artemisia tridentata* and *A. vulgaris,* at Gallatin, and Fort Ellis, Montana, July 1936; Brigham, Hurricane, Logan, Logan Canyon, Paradise and Sardine Canyon in Utah; and Fish Haven, Idaho, August 16, 1927 (Knowlton).

C. hippophaes (Walker). On *Salix* at Farmington and Riverdale, Utah, October 3, 1942; alates on celery in late summer and fall at American Fork, Pleasant Grove and Farmington, in Utah; on *Polygonum* at Puyallup, Washington, August 23, 1937 (H. C. Bennion).

C. longinectarius G.-P. On *Artemisia* at Fishing Bridge, Yellowstone National Park, Wyoming, July 18, 1936 (Knowlton).

C. magnautensis K.-S. On *Chrysothamnus viscidiflorus* at Sisters, Oregon, August 24, 1944 (Knowlton); Lonetree, Wyoming (Knowlton).

C. minor (Forbes). On *Potentilla* at Puyallup, Washington, April (W. W. Baker) and May (A. J. Hanson); on strawberry foliage at Ogden, June 11, 1935 (Knowlton), and Riverheights, July 16, 1935 (C. F. Smith), in Utah.

C. oestlundi K. On *Chrysothamnus nauseosus* at Helena, Mon-

tana, August 2, 1944 (Knowlton), at Lavina and Three Forks, Montana, (H. F. Thornley).

C. packi (K.). *Chrysothamnus nauseosus* at Farmington, Utah; on rabbit brush at Beaver Dam Lodge, Arizona, April 25, 1935 (Knowlton).

C. pseudoglandulosus Palmer. On *Artemisia frigida* at Acton, Montana, July 1, 1942 (Thornley); Monte Cristo, Utah, July 1952 (Knowlton).

C. pullus G.-P. On *Artemisia* at Forsythe, Montana, June 1, 1942 (Thornley); accidental alate on cowparsnip in Logan Canyon, Utah (Knowlton).

C. ribis (L.). Attacking red currant at Wellsville, North Ogden and Linden, Utah during 1953; *Ribes* at Jackson Hole, Wyoming, June 13, 1936 (C. F. Smith); alate on strawberry at Puyallup, Washington, June 30, 1947 (C. D. Schwartz).

C. rusticatus K.-S. *Artemisia cana* at Wheatland, Wyoming, September 9, 1948 (Knowlton—Thornley).

C. wasatchii K. On *Chrysothamnus* at Moses Lake, Washington, April 17, 1947 (Knowlton).

C. xanthii (Oestlund). On cockleburr at American Fork, Utah, September 27, 1950.

Amphorophora agathonica Hottes. On raspberry, *Rubus,* in Glacier National Park, Montana, July 23, 1946 (Knowlton).

A. arnicae Glendenning. On *Arnica* at foot of Puyallup Glacier, Mt. Rainier, Washington, July 3, 1934 (H. C. Bennion); alates on leaves beneath *Populus tremuloides* trees in Smithfield Canyon, Utah, July 28, 1939 (Knowlton—C. J. Davis).

A. brevitarsis G.-P. On *Sorbus,* or Mt. Ash, Paradise Valley, Washington, September 7, 1936 (W. W. Baker).

A. crataegi (Monell). On *Crataegus* at Bountiful, (Knowlton—R. S. Roberts), and alates on chokecherry in Logan Canyon, June 24, 1928 (Knowlton).

A. crystleae S.-K. Numerous on twinberry, *Lonicera,* at Mt. Timpanogos and American Fork Canyon, July 26, 1942, and at Mt. Nebo, in Utah (Knowlton); also Cub River Canyon, Idaho, July 11, 1953 (Knowlton).

A. fronki K. On wild raspberry at Mt. Timpanogos, Utah, July 19, 1951 (Knowlton).

A. goldamaryae K. On wild raspberry, *Rubus,* at Glacier National Park, Montana, July 23, 1946 (G. F. and Mary W. Knowlton).

A. grindeliae (Wms.). On *Grindelia squarrosa* at Ogden, June

4, 1948 (Knowlton), Aspen Grove, Mt. Timpanogos, Utah, June 13, 1940 (C. L. Hayward); several accidental alates collected on celery in northern Utah.

A. halli K. On weeping birch, *Betula,* at Hooper, Utah, August 21, 1939 (Knowlton).

A. janesi K. Alates on *Chrysothamnus parryi* at Joseph, Utah, September 20, 1927 (Knowlton).

A. masoni (K.). On *Helianthus annuus* at Toquerville, Utah, June 18, 1935, and at Geneva Steel Plant west of Orem, Utah; alate male on raspberries at Farmington, Utah, October 22, 1937 (Knowlton).

A. morrisoni (Swain). *Sabina,* on Peavine Ridge, McMannville, Oregon, April 25, 1947 (K. M. Fender).

A. nervata (Gill.). On *Rosa woodsii* at Garden City, Utah, June 1952; Mesa, Arizona, March 25, 1945 (Knowlton); at Hoback, Wyoming, and at Mary's Lake, Montana, July 23, 1946 (Knowlton).

A. nigricornis K. Numerous enough to damage black currants, *Ribes,* at Kaysville, Utah, June 9, 1938 (Knowlton), and on yellow currant foliage at Nibley, Utah, September 19, 1939 (Knowlton).

A. ribiella (Davis). Abundant on *Ribes* at Trenton, Utah, June 1937, on black currant at Farmington, Lewiston, Magna, Richmond, and on "bedbug" currant at American Fork Canyon, and at Altamont, Utah, July 25, 1940 (Knowlton), causing damage in a number of instances.

A. rhokaloza Tissot and Pepper. On *Rhododendron,* Long Beach, Washington, July 20, 1948 (C. Johansen).

A. rubi (Kalt.). Numerous on wild raspberry at Miner's Basin, Grand County, Utah, July 28, 1938 (Knowlton); on *Rubus laceniatus* at Talent, Oregon, May 4, 1951 (L. G. Gentner); black raspberries, Yelm, Washington, July 25, 1936 (G. A. Huber); red raspberries at Hooper, Utah, September 16, 1935 (Knowlton—W. P. Nye); black and cuthbert raspberries at Puyallup, Washington, 1936 and 1952 (G. A. Huber), and Vancouver, Washington (D. L. Bischoff); wild raspberry at Glacier National Park, Montana, July 23, 1946 (Knowlton), and Aspen Grove, Utah, June 13, 1940, and Indian Canyon summit, Utah, September 5, 1945 (Knowlton).

A. rubicola (Oestlund). Salmonberry, Orick, California, June 22, 1939 (Knowlton).

A. rubicumberlandi K.-A. Damaging blackcap raspberries at Puyallup, Washington, June 19, 1939 (Knowlton—Huber); Kelso, Washington, June 21, 1939 (Huber).

A. sensoriata Mason. On raspberry, *Rubus,* at Pleasant Grove, Utah, October 22, 1937 (Knowlton); Baker, and Freewater, Oregon, June 1937 (S. M. Zeller).

A. sonchi (Oestlund). On black currant at Riverton, Utah, October 5, 1938; on crested wheatgrass in the greenhouse at Logan, December 15, 1939; on celery at Midvale and Murray, Utah, October 10, 1952; specimens found to be stored inside a hollow burrow in a blackberry root at Hatch, Washington, July 20, 1937, together with some *Macrosiphum* sp. and other *Amphorophora* spp. (W. W. Baker); damaging black currant at Farmington, Utah, September 30, 1937; Littlefield, Arizona, April 18, 1946 (Knowlton).

A. tigwatensa Hottes. Dewberry at Puyallup, Washington, June 19, 1939 (Knowlton); and abundant on wild raspberry in Miner's Basin, LaSal Mts., Grand County, Utah, July 28, 1938 (Knowlton); raspberry at Puyallup, Washington (C. Johansen); and blackberry at Glacier National Park, Montana, July 23, 1946 (Knowlton).

Supplementary notes: Specimens of *Kakimia wahinkae* (Hottes) were collected on larkspur at Mt. Timpanogos, Utah, July 26, 1942 (Knowlton). *K. utahensis* K. was collected on columbine at Morgan, Utah, July 11, 1947 (Knowlton—T. Tibbetts).

Aphis artemisicola Wms. was very abundant on *Artemisia tridentata* at Huntington, Oregon, June 18, 1939.

Aphis forbesi Weed was abundant in one patch of strawberries at Mill Creek, Utah, June 28, 1925; also taken on strawberry plants at Farmington, August 4, 1925, and abundant in greenhouse at Logan, Utah, March 26, 1942.

Aphis illinoisensis Shimer was taken on grape tendrils at Bloomfield, Mo., May 19, 1922 (A. C. Burrill), and Mercursbury, Pa., June 12, 1931 (J. O. Pepper).

Aphis marutae Oest. on *Cineraria,* Pullman, Washington, November 17, 1941 (L. K. Jones).

Aphis nasturtii Kalt. was moderately abundant on watercress, *Roripa nasturtium,* at Locomotive Springs, Utah, April 10, 1930.

Aphis tulipae (Boyer) was damagingly abundant on carrots in storage at Logan, January 1942, and Salt Lake City, April 3, 1942.

NEOTROPICAL MIRIDAE, LXXI: GENUS *CYRTOCAPSUS* REUTER WITH DESCRIPTIONS OF FOUR NEW SPECIES (HEMIPTERA).

By José C. M. Carvalho,[1] Rio de Janeiro, Brazil.

The genus *Cyrtocapsus* was described by Reuter, 1876 (Ofv. F. Vet. Soc. Förh., 32: 78) for *Capsus caligineus* Stäl, 1859 (Freg. Eug. Resa: 258) which is the type of the genus by monotypy. In 1892 (Ann. Soc. Ent. Fr., 61: 393) Reuter described *C. femoralis* from Venezuela and found *Perithous pallipes* Distant, 1884 congeneric and conspecific with *Cyrtocapsus caligineus* (Stäl). Two other species were added later by Reuter as follows: *C. intermedius* (Acta Soc. Sci, Fenn., 36 (2): 1909) from Trinidad and *C. rostratus* (Ann. Nat. Hofmus. Wien., 22 (1): 1909) from Chile. Knight, 1926 (Bull. Brook. Ent. Soc., 21: 102) described a variety of *caligineus* which he named *aureopubescens* from Florida.

Recently while studying types in European museums, the author discovered the genus *Miccus* Bergroth, 1910 (Ann. Soc. Ent. Belg., 54: 65) to be congeneric with *Cyrtocapsus* Reuter and the type species of the former, by monotypy, *Miccus elutipes* to be identical with *C. femoralis* Reuter, 1892. The species described Distant, 1893 (Biol. Cent. Amer. Rhynch. Het. I: 442, pl. 38, fig. 17) belongs to this genus as pointed out by Carvalho and China, 1951 (Ann. Mag. Nat. Hist, ser. 12, vol. IV: 676).

In the present paper four new species are being described and their genitalia figured. A key for the species of the genus is also included. This study was facilitated by the collection of the U. S. National Museum and the author is indebted to Dr. Reece I. Sailer for laboratory facilities there.

Key to the Species of Cyrtocapsus Reuter

1. Femora (except base) and base of tibiae, black
marginatus (Distant)
(Mexico)

Femora whitish, at most infuscate apically 2

[1] John Simon Guggenheim Memorial Fellow, 1953. Additional assistance was also received from the Brazilian National Research Council.

2. All coxae whitish 3
   At least the two posterior pair of coxae castaneous 7
3. First antennal segment black or castaneous; femora infuscate near apex .... *haitianus* n. sp (Haiti)
   First antennal segment whitish; femora not infuscate near apex 4
4. Head strongly produced below eyes, seen from front the anteocular portion is one and two thirds length of ocular portion *rostratus* Reuter (Chile)
   Anteocular portion of head seen from front about as long as or shorter than the ocular portion 5
5. Embolium and outer margin of cunneus fuscous ferrugineous to rosy ferrugineous; second antennal segment reddish at extreme apex .... *intermedius* Reuter (Trinidad)
   Anteocular portion of head seen from front about as long as or shorter than the ocular portion 5
   Embolium black; second antennal segment whitish 6
6. Second antennal segment longer than first segment *femoralis* Reuter (South America)
   Second antennal segment as long as first segment *nanus* n. sp. (Panama, Trinidad)
7. Anterior coxae entirely pale or whitish .... *caligineus* (Stäl) North, Central & South America)
   Anterior coxae infuscate or black at base 8
8. Second antennal segment 2.2 mm. long; anterior coxae white only at extreme apex .... *andinus* n. sp. (South America)
   Second antennal segment less than 2 mm. long; anterior coxae white on apical half .... *grenadensis* n. sp. (Grenada, Dominica)

Cyrtocapsus andinus n. sp.

Characterized by the color of the coxae, large size and male genitalia.

Male: length 3.0 mm., width 1.8 mm. *Head:* length 0.2 mm., width 1.0 mm., vertex 0.4 mm. *Antennae:* segment I, length 0.4 mm.; II, 0.7 mm.; III, 0.4 mm.; IV, 0.5 mm. *Pronotum:* length 0.8 mm., width at base 1.5 mm. *Rostrum:* length 0.8 mm.

Color: black; embolium, eyes, apex of corium and areolae of membrane, castaneous; antennae, legs and membrane, whitish yellow; sides of head and rostrum, sordid yellow; coxae castaneous (apex of first pair whitish).

Rostrum reaching the middle coxae; embolium incrassate throughout; pubescence of body fairly robust.

Genitalia: pygophore (fig. A) as illustrated. Right clasper pointed (fig. C) with a few setae dorsally. Left clasper (fig. K) strongly curved and pointed apically, with dorsal setae.

Female: similar to male in color and dimensions.

Holotype: male, Canete, Peru, V.17.41, C. P. Clausen col. (208), in the collection of the U. S. National Museum, Cat. No. 61993. *Allotype:* female, same data as holotype. *Paratypes:* males and females: Canete, Peru, V.17.41, C. P. Clausen col.; Lima, Peru (on leaves of sweet potatoes and beans), J. E. Wille, Lot. n. 43.1086; Canete, Peru, May, 5.42, E. J. Hambleton col.; Misiones, Argentina, H. L. Parker col.

This species differs from *C. caligineus* (Stäl) in the color of coxae (castaneous) and in the structure of the male genitalia. From *C. intermedius* Reuter it differs in the much larger size, in the color of pronotum and in the structure of the male genitalia.

Cyrtocapsus nanus n. sp.

Characterized by its short rostrum and short second antennal segment, the small body size and structure of the male genitalia.

Male: length 1.8 mm, width 1.2 mm. *Head:* length 0.2 mm, width 0.7 mm, vertex 0.35 mm. *Antennae:* segment I, length 0.3 mm; II, 0.3 mm; III, 0.3 mm; IV, 0.6 mm. *Pronotum:* length 0.5 mm, width at base 1.1 mm. *Rostrum:* length 0.5 mm.

Color: black; eyes, extreme apex of corium and areolar portion of membrane, castaneous; head laterally and rostrum sordid yellow; antennae and legs, pale stramineous; coxae whitish; labrum reddish; membrane outside the areolae plae fuscous.

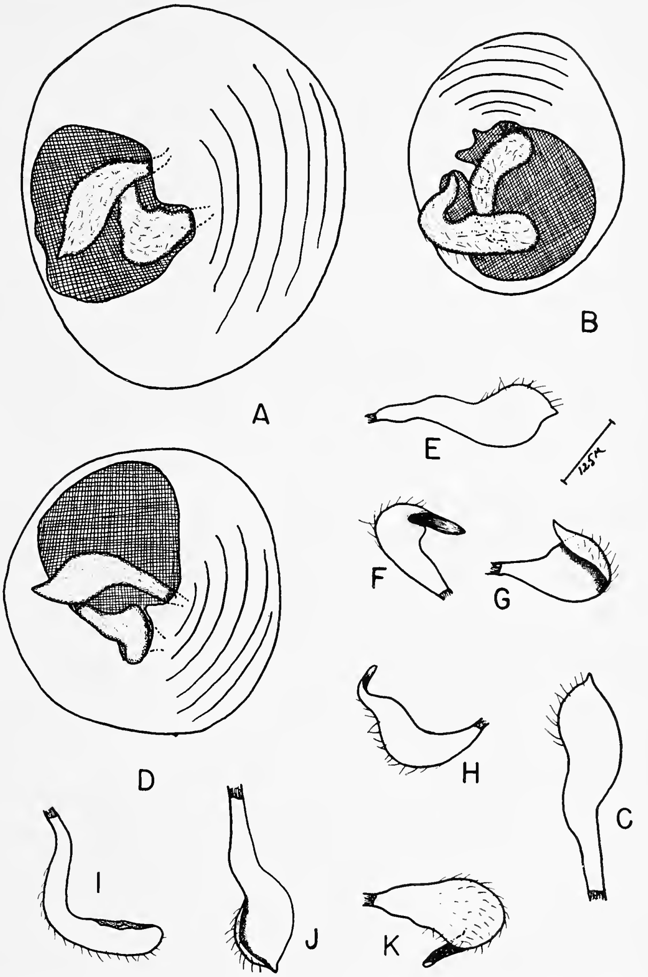
Species of very small size, the cuneus strongly deflexed, scutellum excavate at base; rostrum reaching very slightly beyond the first coxae.

Genitalia: pygophore (fig. B) as illustrated, the right clasper (fig. I) incrassate towards the apex which is blunt; left clasper (fig. H) curved and pointed.

Female: similar to male in color and dimensions.

Holotype: male, Summit, Panama, C. Z., IX.9.46, N. L. H. Krauss col., in the collection of the U. S. National Museum, Cat.

BULL. B.E.S. VOL. XLIX PLATE I



Cyrtocapsus nanus n. sp., B—pygophore and claspers seen from above; I—Right clasper; H—Left clasper. *Cyrtocapsus grenadensis* n. sp., D—pygophore and claspers seen from above; E—Right clasper, dorsal view; J—Right clasper, ventral view; G—Left clasper, ventral view; F—Left clasper, dorsal view. *Cyrtocapsus andinus* n. sp., A—pygophore and claspers seen from above; C—Right clasper, dorsal view; K—Left clasper, dorsal view.

No. 61992. *Allotype:* female, same data as holotype. *Paratypes:* 3 males and 5 females: Summit, Panama, C. Z., IX.946, N. L. H. Krauss col.; Ft. Clayton, Panama, XII.946, N. L. H. Krauss col.; Trinidad, Port of Spain, Oct. 1950, N. L. H. Krauss col., in the collection of the USNM and of the author.

This species is closest to *C. femoralis* Reuter, but differs in the smaller size, in the shorter second antennal segment and in the structure of the male genitalia. From *C. intermedius* Reuter, it differs in the color, in the smaller size and in the structure of the male genitalia. It takes its name after the noticeably small size of body.

Cyrtocapsus haitianus n. sp.

Characterized by its color, especially that of the first antennal segment.

Female: length 3.1 mm, width 1.6 mm. *Head:* length 0.2 mm, width 1.0 mm, vertex 0.52 mm. *Antennae:* segment I, length 0.4 mm; II, 0.5 mm; III, 0.3 mm; IV, 0.6 mm. *Rostrum:* length 0.7 mm.

Color: black; hemielytra (except cuneus) and areolar portion of membrane, castaneous; membrane beyond the aerolae, legs, head laterally, rostrum and coxae, sordid yellow; antennae castaneous to fuscous (first segment noticeably darker); apex of femur with a small castaneous spot.

Rostrum reaching the middle coxae.

Male: unknown.

Holotype: female, Camp Perrin, Haiti, 1925, W. I. Hoffman col. in the collection of the U. S. National Museum Cat. No. 61995. *Paratypes:* 3 females, same data as holotype, in the collection of the USNM and of the author.

This species resembled *C. intermedius* Reuter and *C. andinus* Carvalho, but differs in the color of the antennae and in the spot of apex of femur as well as in the more castaneous color of hemielytra and pronotum.

Cyrtocapsus grenadensis n. sp.

Characterized by its color and structure of male genitalia.

Male: length 3.0 mm, width 1.3 mm. *Head:* length 0.2 mm, width 0.7 mm, vertex 0.39 mm. *Antennae:* segment I, length 0.4 mm; II, 0.5 mm; III, 0.3 mm; IV, 0.6 mm. *Pronotum:* length 0.6 mm, width at base 1.2 mm. *Rostrum:* length 0.6 mm.

Color: black; hemielytra (except cuneus) and areolar portion

of membrane, castaneous; antennae and legs, whitish stramineous; sides of head and rostrum, dirty yellow; coxae castaneous (except apex of first pair).

Rostrum reaching the middle coxae.

Genitalia: pygophore (fig. D) as shown in illustration. Right clasper (figs. E, J), pointed, broader near the apex, with dorsal setae. Left clasper (figs. G, F) pointed and strongly curved apically, with dorsal setae.

Female: similar to male in color and dimensions.

Holotype: male, Dominica, W. I., R. G. Fennah col., 6.15.41, in the collection of the U. S. National Museum, Cat. No. 61994. *Allotype:* female, Mirabeau Est. (Windward Side), Grenada, W. I., H. H. Smith. *Paratypes:* one male, same data as holotype and one female, same data as allotype, in the collection of the USNM and of the author.

This species differs from *C. andinus* in the more castaneous hemielytra and in the structure of the male genitalia. From *C. caligineus* (Stäl) it differs in the color of the coxae and in the structure of the male genitalia.

A New Name for *Martia* Forel (Hymenoptera): Recently, Miss Ina Hawes, Librarian of the U. S. Department of Agriculture, Washington, D. C. inquired if the ant name, *Martia* Forel, was not preoccupied. Upon carefully checking the matter I find that it is, *Martia* having first been used by Ragonot in 1887 as a name for a genus of moths of the family Phycitidae. The chronology is as follows:

Martia Ragonot, 1887. Diagnoses of North American Phycitidae and Galleridae, p. 18 (published by the author).

Monomorium, subgenus *Martia* Forel, 1907. Ann. Mus. Nat. Hung. 5: 20.

At the suggestion of my friend and colleague, Dr. Nicolas Kusnezov of the Fundacion Miguel Lillo, Tucuman, Argentina who has recently published a paper on this group (1952. Acerca de las hormigas simbióticas del género *Martia* Forel. Acta Zool. Lilloana (Tucuman) 10: 717–722) I hereby propose the new name, *Forelifidis* for these ants.—Marion R. Smith, Washington, D. C.

THREE NEW MEALYBUG PARASITES OF THE GENUS *ALLOTROPA* (HYMENOPTERA: PLATYGASTERIDAE).

By C. F. W. Muesebeck, Washington, D. C.

The genus *Allotropa* Foerster has had little study although certain species appear to be of considerable importance in the control of injurious mealybugs. All species of which the hosts are known are mealybug parasites. They are small insects, none of the species known to me measuring more than one millimeter in length. Only about a dozen species have been described. I suspect, however, from the frequency with which undescribed species have come to my attention in recent years and in view of the occurrence of the genus in all the major zoogeographical regions, that the group is a fairly large one. If that is true, much critical study will be required for the development of workable keys, especially keys to aid in the recognition of the females. Thus far it has not been very difficult to distinguish the known species in the male sex because of good characters furnished by the antennae, but the female antennae of the known species are very similar and for identification of this sex close attention has had to be given to small differences in structure, sculpture, and color.

Three apparently undescribed species for which names are wanted are described here.

The illustrations were prepared by Arthur D. Cushman, U. S. Bureau of Entomology and Plant Quarantine.

Allotropa citri n. sp.

In its smooth and polished scutellum and somewhat convex face this species resembles *convexifrons* Mues., but it is immediately distinguished by its clear hyaline wings, dark femora, and thicker, dorsally more convex, flagellar segments of the male antennae.

Male.—Length about 0.8 mm. Head barely wider than thorax; face evenly, finely reticulate or coriaceous; vertex shagreened; antenna as in Fig. F, the longer bristles of the basal flagellar segments not in clusters and relatively short, flagellar segments 2 to 6 each barely twice as long as high. Mesoscutum finely shagreened, shining; scutellum smooth and polished, rather flat; propodeum and metapleuron densely covered with long, silky hairs.

Black; antennae piceous, lighter below; legs piceous to black, with coxae not as dark as femora, and with all trochanters, all tibiae basally and the fore tarsi, yellowish.

Female.—Stouter than the male; antenna as shown in Fig. E; mesoscutum more strongly sculptured and less shining than in the male. Scape, pedicel and basal three segments of antennal flagellum yellow, the club blackish; hind coxae yellow; tibiae yellow, the posterior pair and sometimes the middle pair a little infuscated; all tarsi pale except for apical segment of each.

Type locality.—"South China."

Type.—U. S. National Museum No. 62212.

Host.—*Planococcus citri* (Risso).

Described from 29 males and 25 females reared from *P. citri* in propagations laboratories at Albany and Riverside, California. The stock had been obtained from South China by J. Linsley Gressitt.

Allotropa scutellata n. sp.

This species may be rather easily distinguished from the other described New World species by the combination of a strongly convex, closely sculptured and dull scutellum with a smooth and polished face and yellow legs.

Male.—Length nearly 1 mm. Head as wide as thorax; face mostly impunctate and highly polished, with only a narrow transverse strip above insertion of antennae, and sometimes small, indefinitely defined areas adjacent to eyes, finely reticulate; cheeks coriaceous and mat; antenna as in Fig. D, all flagellar segments more than three times as long as high, the longest bristles of the basal segments much longer than the scape. Mesoscutum very finely rugulose and dull, rather thickly covered with short hair; scutellum unusually strongly convex, finely rugulose and dull, hairy; propodeum and metapleuron densely covered with long, silky hairs.

Black; antennae brownish yellow; wings hyaline; subcostal vein yellow; legs brownish yellow, including all coxae except anterior pair which are a little infuscated basally.

Female.—Essentially as in the male except for the antennae (Fig. C). Club of antenna brown.

Type locality.—Sao Paulo, Brazil.

Type.—U. S. National Museum No. 62213.

Host.—*Pseudoccus* sp. on *Moquiela tomentosa.*

Described from 47 males and 17 females reared by H. L. Parker and Paul A. Berry in 1945. Several specimens of both sexes, which I consider the same species, are recorded as reared by Parker and Berry from *Pseudococcus* sp. on *Annona* in 1945 at

Campo Grande, Brazil. They are not, however, included in the type series.

Allotropa merrilli n. sp.

This species is so similar to *ashmeadi* Mues. that it is not easily distinguished even in the male sex. The antennae and legs are darker, however; the mesoscutum is more strongly sculptured and not so shining, and the scutellum is more convex.

Male.—Length about 0.75 mm. Head as wide as thorax; face shining, delicately coriaceous except for a small median area that is smooth and polished; vertex coriaceous and mat; antenna as in Fig. B, the longer dorsal setae arranged in small clusters and about

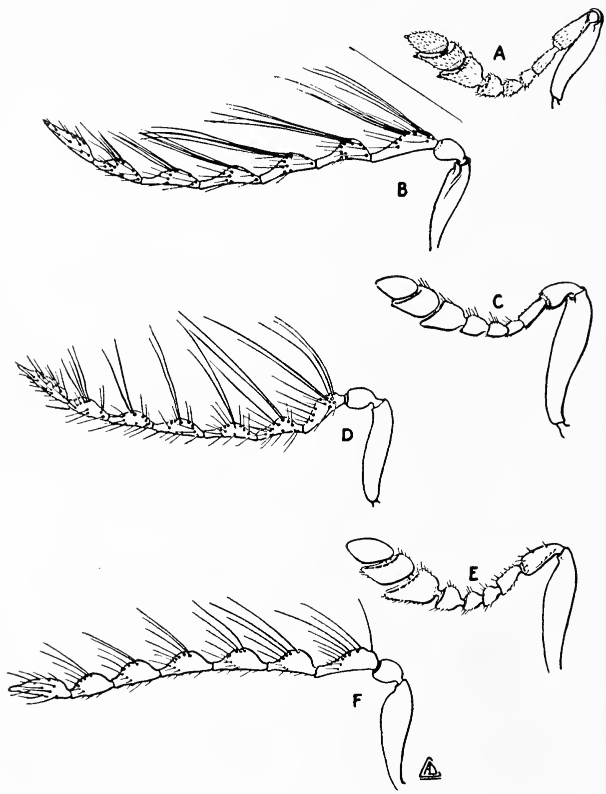


Fig. 1. Antennae: A, female of *Allotropa merrilli,* B, male of same; C, female of *Allotropa scutellata,* D, male of same; E, female of *Allotropa citri,* F, male of same.

as long as the basal three flagellar segments combined. Mesoscutum closely, finely shagreened and mat; scutellum very large, evenly convex, a little less strongly sculptured than mesoscutum and somewhat shining.

Black; antenna brownish yellow, scape piceous above; wings hyaline, subcostal vein dark brown; legs piceous, the anterior and middle pairs weakly so.

Female.—Antenna as in Fig. A; sculpture similar in character to that of male but a little stronger; antennae and legs dark brown.

Type locality.—Melrose, Florida.

Type.—U. S. National Museum No. 62214.

Host.—*Trionymus* sp. on bald cypress.

Described from 3 males and 5 females reared by G. B. Merrill May 21, 1943. Other specimens reared from an unknown mealybug on cypress at New Orleans, Louisiana, are the same species, in my opinion, but are not included in the type series.

A simple technique for improving and accelerating KOH clearing of insects.—Quite by accident some years ago I discovered that it is possible to take advantage of the difference in boiling points between 5 or 10% KOH and ethyl alcohol in clearing insects of their internal organs. Whereas the standard recommendation of rolling the KOH-loosened contents out of an insect with a camel's hair brush is often difficult, time consuming and damaging, the technique outlined below is simple, quick, and particularly advantageous with delicate insects or structures.

The technique consists first of treating the specimen in KOH but only until the internal organs are completely loosened, not completely dissolved. Then the specimen is placed in alcohol and ventilated for a few seconds by squeezing the specimen lightly a few times. (Or it can be permeated with alcohol simply by leaving it in the alcohol for a minute or two.)

Finally the specimen is dropped back into hot KOH. The alcohol within it immediately boils and simply, quickly, and without damage carries out all loose particles (through a previously prepared hole in the integument).—J. F. Hanson, Amherst, Mass.

SCHINIA MACROPTICA SMITH, A SYNONYM (LEPIDOPTERA, PHALAENIDAE).

By Rowland R. McElvare, Southern Pines, N. C.

John B. Smith (1900) described *Schinia oculata* from a defective male and one good female. The species is characterized by a "broad median space silvery white, without band, but with a large kidney-shaped reniform, which is ocherous and emphasized with black scales." Later (1906), he described *Schinia macroptica* from a unique female. "The very large discal spot of the primaries, shaded with golden brown in the silvery white median space, marks this species at once. From *oculata* to which the new form is allied, it differs by the much broader basal and outer luteous areas, as well as by the much larger and differently shaped reniform." All three type specimens are from the Sonoran desert, and the male of *oculata* resembles the female *macroptica* to a marked degree.

Fig. 1. *Schinia oculata* Sm., ♀ type, U.S.N.M. (Photo 2×).

Fig. 2. *Schinia macroptica* Sm., ♀ type, John B. Smith Collection (Photo 2×).

Study of a series of forty specimens from the Sonoran and Colorado deserts indicates that Smith's types represent extremes of

one variable species. The female of *oculata* has faint markings and a semicircular reniform. Other specimens with faint markings show a reniform completed outwardly to form the oval attributed to *macroptica*. The type of *macroptica* is characterized by bold markings and an oval reniform. Other boldly marked specimens show a reniform varying from oval to semicircular. There appears no point at which a line of demarcation can be drawn between the two species. Examination of the armature of the foretibiae and the male genitalia confirms this.

Accordingly *Schinia macroptica* Sm. is a synonym of *Schinia oculata* Sm.

Acknowledgments

Part of the material for this study was made available through the courtesy of the Entomological Departments of the American Museum of Natural History, California Academy of Sciences, Los Angeles County Museum and the United States National Museum.

Photograph of type of *Schinia macroptica* Sm. by Lyle Hagmann, Rutgers University.

Literature Cited

Smith, John B. 1900. Schinia oculata, Proc. U.S.N.M., Vol. 22, p. 488.

————. 1906. Schinia macroptica, Journal N. Y. Entom. Soc., Vol. 14, p. 21.

COLEOPTERA AND DIPTERA REARED FROM OWL NESTS[1]

By Robert D. Lee and Raymond E. Ryckman,

Loma Linda, California

Nest material from the nest of a burrowing owl, *Speotyto cunicularia hypogaea* (Bonaparte), was collected and examined on May 13, 1953, one mile west of Loma Linda, San Bernardino County, California. The nest site was apparently that of an abandoned rodent (possibly ground squirrel) burrow; the nest itself was located about two feet from the burrow entrance.

Diptera and Coleoptera larvae and pupae were segregated from the debris and reared in cloth covered jars containing sand. The

[1] Contribution from the Department of Entomology, School of Tropical and Preventive Medicine.

excised leg muscles of a freshly killed squirrel were put in the jars as food for the larvae; the colonies were kept at room temperature.

Adults reared from this material were identified as follows:

Diptera
- Empididae: *Drapetis* sp., 6 specimens;
- Muscidae: *Muscina stabulans* (Fallen), 11 specimens; *Fannia canicularis* (L.), 1 female.

Coleoptera
- Histeridae: *Saprinus obscurus* Le Conte;
- Staphylinidae: *Philonthus sordidus* Grav.; 1 Aleoncharinae.

Diptera pupae were taken from the nest of a horned owl, *Bubo virginianus* (Gmelin), on June 1, 1953, 17 miles north of Flagstaff, Arizona. The nest was located in a dead pine snag about 25 feet from the ground. Three fledgling owls escaped from the nest.

The pupae were reared in cloth covered jars at room temperature. The adults were identified as follows:

- Calliphoridae: *Protocalliphora* sp., 3 specimens;
- Trixoscelidae: *Neossos marylandica* (Malloch), 1 specimen.

It is believed that this is the second time *N. marylandica* has been recorded since its description from Maryland and the first time it has been recorded from Arizona. It was taken once in California from the nests of barn owls by Ryckman (1953).

The authors are indebted to Willis W. Wirth for the identification of the *Drapetis* specimens, to Curtis W. Sabrosky for the identification of the other Diptera, and to H. B. Leech for the identification of the Coleoptera. Many of the Diptera specimens have been retained by the U. S. National Museum, and the Coleoptera have been retained by the California Academy of Sciences.

Literature Cited

Ryckman, Raymond E. 1953. Diptera reared from barn owl nests. Pan.-Pac. Ent. 29 (1): 60.

NOTICE

A NEW SPECIES OF COPABLEPHARON (LEPIDOPTERA, NOCTUIDAE, NOCTUINAE).

By JOHN G. FRANCLEMONT,[1] Ithaca, New York

This striking species, the description of which has been promised John C. Hopfinger of Brewster, Washington, has stood in the United States National Museum Collection and in my collection with a manuscript name for a considerable time. It seems advisable to put the description of this species on record before the name is used inadvertently.

Copablepharon hopfingeri n. sp.

Antennal scape white, shaft white scaled above; palpi, head and thorax sordid white; palpi with pale fuscous shadings outwardly; head with a pale greenish yellow cast between the antennae; patagia (collar), tegulae, and anterior part of thorax suffused with greenish yellow; fore wing sordid with underlying pale fuscous scaling, giving the wing a silvery gray effect, a strong greenish yellow shade in the cell extending almost to outer margin, another similar shade in the anal fold extending from base to close to outer margin, an indistinct series of dots on some of the veins at about outer fifth of wings; hind wing smoky fuscous; fringe of both wings white and contrasting; abdomen with yellowish shading dorsally, most conspicuous at base; legs white, lightly suffused with pale fuscous.

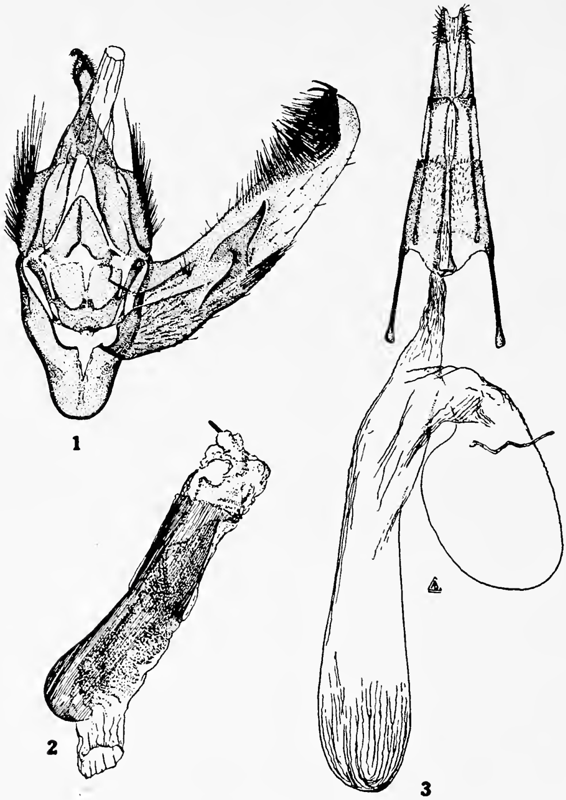
Expanse: 37–41 mm.

Male genitalia with the uncus long, cygnate (foreshortened in drawing); sides of tegumen broad, penicillus lobes well developed; vinculum narrow, saccus blunt; valves long, moderately slender, costa and ventral margin subparallel; clasper with a broad base, tapering to a point; corona strong, apex (cucullus) of valve extending beyond it; editum (costal hair tuft) small and inconspicuous; juxta broad, rather lightly sclerotized; clavi slender, digitate, slightly dilated distally; aedoeagus stout, slightly curved; vesica armed with a single small, truncate cornutus.

Female genitalia with the ovipositor lobes long and narrow; posterior apophyses long; ductus bursae and bursa membraneous; bursa with an expanded, moderately long lateral arm on right side; ductus seminalis from near upper fourth of arm.

Type: Male, Bar, W. [Bar, Washington, four miles from Brew-

[1] Department of Entomology, Cornell University.



EXPLANATION OF FIGURES

1. Male genitalia of *Copablepharon hopfingeri* Franclemont (Type), left valve not drawn, aedoeagus removed. 2. Aedoeagus of Type. 3. Female genitalia of *Copablepharon hopfingeri* Franclemont (Paratype).

ster, Washington], VI-1-37 (June 1, 1937), collected by John C. Hopfinger. United States National Museum Type No. 54942. In the Collection of the United States National Museum.

Paratypes: One male, Brewster, Wash. [Brewster, Okanogan County, Washington], V.9.1923 (May 9, 1923), collected by John C. Hopfinger, (ex Herman J. Erb Collection) in Franclemont Collection; one female, Bar, Wash. (Bar, Washington). June 20-39 (June 20, 1939), collected by John C. Hopfinger, in the United States National Museum Collection.

Superficially this species resembles *Copablepharon absidum* Harvey, 1874, but it is gray, not yellow, and the hind wings are much darker with contrasting fringes.

This species is named in honor of its collector, John C. Hopfinger.

The drawings are by Arthur D. Cushman of the Division of Insect Detection and Identification, Bureau of Entomology and Plant Quarantine, United States Department of Agriculture, Washington, D. C.

HOMOPTERUS HONDURENSIS DARLINGTON (COLEOPTERA-PAUSSIDAE) FROM YUCATAN, MEXICO.

By John C. Pallister,[1] New York, N. Y.

While collecting during the summer of 1952, in Yucatan, Mexico, I took one specimen of this curious family of beetles. The record of its capture is interesting, because it broadens the known distribution of not only the species, but the genus and family much farther to the north than previously recorded.

This insect was taken at Colonia Yucatan, Mexico, August 19, 1952 (J. and D. Pallister) ; The C. R. Vose Fund, Explorers Club-American Museum of Natural History Entomological Expedition to Yucatan. It was swept from weeds and vegetation, about two feet from the ground, bordering a trail through deep forested jungle. Colonia Yucatan, where the headquarters of the lumber interests of the Maderera del Tropica is located, is a village about forty miles east of Tizimin, along the extreme northeastern border of the State of Yucatan, and close to the Territory of Quintana Roo.

Dr. P. J. Darlington (Psyche, 1937, vol. 44, pp. 56–57, fig. 1, A new Paussid beetle from Central America) described this species from a unique specimen collected at Lancetilla, Honduras. This was the first record of a Paussid beetle from the Central Americas north of Panama. Other specimens of this species have since been taken at Barro Colorado Island. In 1950, Darlington discovered a specimen of this species in the collections of the American Museum of Natural History from Punta Gorda, British Honduras, B.W.I., Colombia River District, March, 1934 (J. J. White), which he compared with the type.

[1] Research Associate, Department of Insects and Spiders, American Museum of Natural History.

The present new record for this insect extends its distribution much further to the north, into Mexico, where Paussid beetles were not known to occur. It is likely, however, that future collecting may add many more distributional records for this species in southern Mexico as well as in Yucatan.

The genus *Homopterus* is restricted to the Americas. Its eight species are distributed from southern Mexico through Panama, Colombia, Bolivia, Venezuela, the Guianas, and most of Brazil north from Mato Grosso. In contrast to most of the genera of this odd family of beetles which reach their greatest development and specialization in Africa, Asia, the East Indies, and Australia, *Homopterus* is rather primitive and unspecialized.

A Campsomeris New to the New York State List (Hymenoptera, Scoliidae).—Several years ago L. L. Pechuman sent me a single male of the polytypic species, *C. plumipes* (Drury), which he had collected at Alabama, Genesee County, New York on May 30, 1951. It was not then possible to assign this male to the subspecies *confluenta* (Say) or to typical *plumipes*, for the two subspecies are separable only on the basis of characters of the females. However, on June 16, 1953, Dr. Pechuman collected two females of *plumipes confluenta* at Hamlin Beach State Park, Monroe County, New York. It is assumed, therefore, that the male captured by him several years earlier in an adjacent county also represents *p. confluenta* rather than typical *plumipes*. *C. plumipes confluenta* is the midwestern race of this polytypic species, and has not been recorded previously from further east than Hamilton, Ontario, Canada. Typical *plumipes* also occurs in New York, but only on Long Island and Staten Island, and around New York City. It appears rather unlikely that there is any zone of intergradation between the two subspecies in New York State.—Karl V. Krombein, Arlington, Virginia.

PUBLICATIONS RECEIVED

The Ant World, by D. W. Morley. 191 pp., 14 textfigures. $4\frac{1}{4} \times 7$ ins., paper bound. 1953. Penguin Books Inc., Baltimore, Md. (Price, $.50.)

The Beetles of the Pacific Northwest, Part 1: Introduction and Adephaga, by Melville H. Hatch. 340 pp., 37 plates. 7×10 ins., paper bound. 1953. University of Washington Press. (Price, $5.00.)

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LEPIDOPTERA AND ORTHOPTERA from Florida in papers and local specimens mounted to exchange for other Lepidoptera. —Alex K. Wyatt, 5842 N. Kirby Avenue, Chicago (30), Ill.

WANTED—Geometrid moths, for cash or exchange. John L. Sperry, 3260 Redwood Drive, Riverside, Calif.

CERAMBYCIDAE AND CHRYSOMELIDAE from Asia and Pacific desired for determination; purchase; exchange.—J. Linsley Gressitt, Pacific Science Board, Bishop Museum, Honolulu, T.H.

WANTED—Psyche, vols. 11, 13, 15; Trans. Amer. Ent. Soc., vols. 1–5. C. F. dos Passos, Mendham, New Jersey.

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CONTENTS

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BULLETIN

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BROOKLYN ENTOMOLOGICAL SOCIETY

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ANOPLURA FROM SOME JAPANESE SMALL MAMMAL HOSTS[1]

By John E. Scanlon[2]

The Anoplura infesting rodents in Japan were dealt with briefly by Sasa in 1950. Sasa reported the following species for the first time from Japan: *Hoplopleura acanthopus* (Burmeister), *Hoplopleura oenomydis* Ferris and *Polyplax serrata* (Burmeister). In addition he commented on the occurrence in Japan of *Polyplax spinulosa* (Burmeister) and described one new species, *Hoplopleura akanezumi.*

The present paper reviews Sasa's records and gives additional records of lice from rodents and insectivores collected during a survey of small mammal ectoparasites conducted in the four main islands of Japan during the years 1951–1953. The localities listed in the distribution records given below are indicated on the accompanying map (Figure 1). Records drawn solely from Sasa's report are indicated by the letter S following the citation. All of the lice examined during this study were members of the family Hoplopleuridae Ferris and of the genera *Hoplopleura* Enderlein and *Polyplax* Enderlein.

The species of mammals from which Anoplura were recovered during 1951–1953 study and the number of each species examined are given in the host-parasite list (Table I).

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[1] Contribution of the Department of Entomology, Far East Medical Research Unit, United States Army, APO 500.

[2] 1st Lieutenant, Medical Service Corps, United States Army.

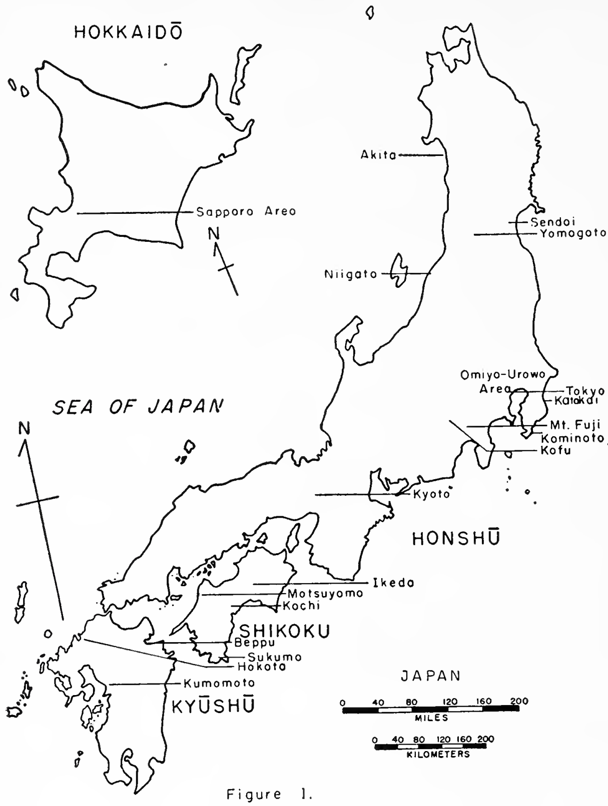

Fig. 1. Location of areas given in the distribution records.

In addition the following specimens of mammals were examined with negative results: Rodentia—*Glirulus japonicus* (3), Insectivora—*Sorex araneus* (4), *Sorex caecuticus* (8), *Talpa micrura* (13), *Urotrichus pilirostris* (4), *Urotrichus talpoides* (95). This apparent absence of Anoplura from *Talpa* and *Urotrichus* agrees with records published by Ferris (1951) and Hopkins (1949) and it seems quite certain that moles of these genera are not naturally infested with sucking lice. On the other hand the negative findings as regard *Glirulus* and the two species of *Sorex* may represent a lack of sufficient specimens for examination coupled with a low rate of infestation rather than a complete absence of lice.

The writer wishes to express his gratitude to the many mem-

bers of the Department of Entomology, 406th Medical General Laboratory, who were responsible for the collection and preparation of the material studied, to Mr. C. F. W. Muesebeck and Dr. Fabio L. Werneck for their aid in the determination of a number of specimens and to Major Paul W. Oman for his guidance and assistance.

Table I
Host-Parasite List

Host	Number Examined	Anoplura
Insectivora		
Crocidura russula	5	*Polyplax reclinata*
Rodentia		
Apodemus speciosus	586	*Hoplopleura affinis*
		Polyplax serrata
Apodemus sylvaticus	221	*Hoplopleura affinis*
		Polyplax serrata
Clethrionomys rufocanus	60	*Hoplopleura acanthopus*
Microtus montebelli	169	*Hoplopleura acanthopus*
		Polyplax abscisa
Micromys minutus	15	*Hoplopleura longula*
		Polyplax gracilis
Mus musculus	26	*Hoplopleura acanthopus*
Rattus norvegicus	267	*Hoplopleura oenomydis*
		Polyplax spinulosa
Rattus rattus	94	*Hoplopleura oenomydis*
		Polyplax spinulosa

Hoplopleura acanthopus (Burmeister)

Pediculus acanthopus Burmeister, 1839, Genera Insectorum, Rhynchota, Number 5, Figure 2, Halle.

Type Host: *Microtus arvalis,* Europe.

Comments and Records: This species has been reported from various rodent hosts of the genus *Microtus* and related genera in Europe and North America. Sasa reported finding it on 52 of 132 *Microtus montebelli* and it has been rather common in our collections. Specimens from the three host species listed below agree well and present no valid basis for separation. Records for the species are as follows:

Clethrionomys rufocanus—Hokkaido: Sapporo.

Microtus montebelli—Honshu: Akita (S), Yamagata (S), Omiya, Tokyo, Mt. Fuji.

Mus musculus—Honshu: Tokyo.

Hoplopleura affinis (Burmeister)

Pediculus affinis Burmeister, 1839, Genera Insectorum, Rhynchota, Number 10, Halle.

Hoplopleura akanezumi Sasa, 1950, Japanese Journal of Experimental Medicine 20: 715–717. (New Synonymy.)

Type hosts: *Apodemus agrarius* and *A. sylvaticus,* Europe.

Comments and records: This species was the most abundant louse found on wild rodents in the survey and it was recovered from almost every host of the genus *Apodemus* examined. On several occasions it was taken in multiple infestations of *Apodemus speciosus,* the other louse species involved being *Polyplax serrata* (Burmeister). Sasa described *H. akanezumi* from *A. speciosus* and stated that it differed from *H. affinis* only in having a conspicuous anterior projection of the thoracic sternal plate. Examination of a large series of specimens from many areas of Japan, and in many cases numbers from one individual host, showed this to be a variable character and not sufficient to separate the specimens from *H. affinis.* Therefore, it is here held that *H. akanezumi* Sasa is a synonym of *H. affinis* Burmeister. Specimens were examined by Dr. F. L. Werneck who concurred in this opinion. Records for the species are as follows:

Apodemus speciosus—Hokkaido: Sapporo. Honshu: Akita (S), Yamagata, Niigata (S); Sendai, Urawa, Tokyo, Mt. Fuji, Kyoto. Shikoku: Matsuyama. Kyushu: Hakata, Beppu, Kumamoto.

Apodemus sylvaticus—Honshu: Mt. Fuji, Kyoto.

Hoplopleura longula (Neumann)

Haematopinus (*Polyplax*) *longulus* Neumann, 1909, Archives de Parasitologie 13: 513–515, figures 15–17.

Type host: *Micromys minutus,* Colchester, Essex, England.

Comments and records: Our specimens agree well with the original description and figures and with Ferris' diagnosis and figures (1921). They differ from the latter and from the key characters given in Ferris' later work (1951) only in having two very minute setae on the posterior margins of the paratergal plates of abdominal segments 4–6. The first determination of this species from Japa-

nese material was made by Mr. C. F. W. Muesebeck. Records are as follows:

Micromys minutus—Honshu: Urawa, Mt. Fuji. Shikoku: Matsuyama.

Hoplopleura oenomydis Ferris

Hoplopleura oenomydis Ferris, 1921, Contributions Toward a Monograph of the Sucking Lice, Part 2: 82–84, Stanford.
Type host: *Oenomys hypoxanthus,* Molo, British East Africa.
Comments and records: Since its original description this species has been reported from a number of hosts, mostly of the genus *Rattus,* in Africa, North America, Asia and the Pacific Islands. It is very common on *R. norvegicus* in the southern United States and was recorded by Sasa as being the most common species of louse seen by him, occurring in 45% of the *R. norvegicus* and *R. rattus* examined. In the present study the highest percentage of infestation found was approximately 35% in a group of 116 domestic rats taken in Kofu City. Records for the species are as follows:

Rattus norvegicus—Honshu: Urawa, Kofu. Shikoku: Matsuyama.

Rattus rattus—Honshu: Urawa, Kofu.

Polyplax abscisa Fahrenholz

Polyplax abscisa Fahrenholz, 1938, Zeitschrift für Parasitenkunde 10: 257, figures 13, 14.
Type host: *Arvicola* sp., California.
Comments and records: Fahrenholz described this species from material taken from voles collected in North America. *P. abscisa* is very close to *P. spinulosa* differing from that species most significantly in the shape of the male genital structures. The specimens from Japan agree excellently with Ferris' figures and notes (1942). It is probable that Sasa had this species in hand when he reported *P. spinulosa* from *Microtus montebelli* collected at Camp Fuji. Examination of his specimens by the writer disclosed only female specimens and these appeared to be *P. abscisa,* but the question cannot be settled satisfactorily in the absence of males. Our specimens from *M. montebelli* from Mt. Fuji were definitely *P. abscisa.* Records for this species are as follows:

Microtus montebelli—Honshu: Tokyo, Mt. Fuji.

Polyplax gracilis Fahrenholz

Polyplax gracilis Fahrenholz, 1910, Diagnosen neuer Anopluren,

Zoologischer Anzeiger 34: 715.
Type host: *Micromys minutus,* Europe.
Comments and records: This species apparently has not been collected since the original specimens were taken from the type host in Europe. The specimens from Japan and others from the same host species collected in Korea agree well with the original description and with subsequent figures and notes published by Fahrenholz (1938) and Jancke (1932). *P. gracilis* is quite close to *P. serrata,* but it may be distinguished from that species chiefly by its lack of long dorsal setae on the paratergites of the fourth abdominal segment, its very slender and elongate form, and the shape of the thoracic sternal shield. The specimens of *P. gracilis* at hand will be deposited at the U. S. National Museum after further study. The record for Japan is as follows:
Micromys minutus—Honshu: Mt. Fuji.

Polyplax reclinata (Nitzsch)

Pediculus reclinatus Nitzsch, 1864, Zeitschrift für den gesamten Naturwissenschaften 25: 23.
Type host: *Sorex araneus,* Europe.
Comments and records: *P. reclinata* has been found on several species of shrews in Europe and Asia. The specimens from the single infested host found during the present study showed considerable variation, particularly in the length of the setae of the paratergal plates and the size of the abdominal spiracles, but generally agreed well with published figures and descriptions of *P. reclinata.* Specimens were examined by F. C. Werneck who agreed with the determination. The single record is as follows:
Crocidura russula—Honshu: Kyoto.

Polyplax serrata (Burmeister)

Pediculus serratus Burmeister, 1839, Genera Insectorum, Rhynchota, No. 6, Halle.
Type host: *Mus musculus,* Europe.
Comments and records: Although originally described from *Mus musculus* and reported often from that host, this species has also been found many times on hosts of the genus *Apodemus* in Europe and Asia. Sasa reported the species as rather uncommon on *A. speciosus* at Mt. Fuji, but in our collections in this area it has been very common. Our records are as follows:
Apodemus speciosus—Honshu: Ojojihara, Sendai, Tokyo, Mt. Fuji, Kyoto, Ikeda. Shikoku: Matsuyama. Kyushu: Beppu.

Polyplax spinulosa (Burmeister)

Pediculus spinulosus Burmeister, 1839, Genera Insectorum, Rhynchota, No. 8, Halle.

Type host: *Rattus norvegicus,* Europe.

Comments and records: This cosmopolitan species was recorded by Sasa as being common on *Rattus norvegicus* and *R. rattus* in Japan and our records substantiate this report. *P. spinulosa* was recovered from both species of domestic rats wherever these were trapped in any numbers. Our records are as follows:

Rattus norvegicus—Honshu: Urawa, Tokyo. Shikoku: Sukumo. Kyushu: Beppu.

Rattus rattus—Honshu: Urawa, Katagai, Kominato. Kyushu: Beppu.

Summary

Records of Anoplura from a number of species of Japanese rodents and insectivores are presented and the following species of lice are reported for the first time from Japan: *Hoplopleura longula* (Neumann), *Polyplax abscisa* Fahrenholz, *Polyplax gracilis* Fahrenholz and *Polyplax reclinata* (Nitzsch). The specimens for *P. gracilis* are the first to be collected since the description of the species in 1910. *Polyplax akanezumi* Sasa, a common ectoparasite of rodents of the genus *Apodemus* in Japan, is here held to be a synonym of *Polyplax affinis* (Burmeister).

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SOME EAST AFRICAN DIPTERA OF THE FAMILIES ACROCERIDAE, ASTEIIDAE AND CHLOROPIDAE.[1]

By Curtis W. Sabrosky,[2] Washington, D.C.

A small collection of certain families of Diptera from the East African Expedition of the Staatliches Museum für Naturkunde in Stuttgart was made available for study through the kindness of Dr. E. Lindner, leader of the expedition. One genus and four species are here described as new, with type material in the Stuttgart Museum except as noted. Several other specimens probably represent new species, but the genera to which they belong have not been studied sufficiently, or adequate series are necessary.

Acroceridae

This family has been called Cyrtidae by Sack (1936, in Lindner's "Die Fliegen der palaearktischen Region") and other authors, but Acroceridae is the oldest proposed family name based on a valid included genus. I prefer that spelling to Acroceratidae, following the reasonable suggestions of Grensted (1948, Ent. Monthly Mag. 84: 280–281).

I know of only one published record of the genus *Acrocera* from the Ethiopian Region, *Acrocera* (*Paracrocera*) *globulus* (Panzer), recorded by Brunetti (1926, Ann. & Mag. Nat. Hist., ser. 9, 18: 587) from "Abyssinia, 6.XII.1907." The species described below is therefore of unusual interest.

Acrocera lindneri n. sp.

Acrocera with trivittate mesonotum, and second longitudinal vein incompletely developed.

Female.—Predominantly black, with conspicuous, deep yellow to orange markings and short yellowish hairs. Head black. Mesonotum shining, orange, with three broad black stripes which are fused for a short distance in front of scutellum, the median stripe complete in full breadth from neck to scutellum, but the lateral stripes anteriorly abbreviated, their broadly rounded to subquadrate anterior ends well posterior to humeri, and posteriorly slightly convergent toward the inner angles of the postalar calli; no supra-

[1] Ergebnisse der Deutschen Zoologischen Ost-Afrika-Expedition 1951–52, Gruppe Lindner, Stuttgart, Nr. 11.

[2] Bureau of Entomology and Plant Quarantine, Agricultural Research Service, U.S. Department of Agriculture.

alar vittulae, each orange lateral area nearly as wide as a stripe; humeri and propleura white to pale yellowish; postalar calli chiefly black, the posterior third yellow to whitish; pleura, scutellum and metanotum black. Dorsum of abdomen marked with black and orange, the pattern resembling that of *A. trigramma* Loew (Sack, 1936, in Lindner, vol. 4, family 21, plate 2, fig. 11), but more extensively black, segments 2 and 3 (apparent 1 and 2) with a large mesal diamond-shaped black spot formed by a basal triangle on segment 3 and a similar but reversed apical triangle on the second segment, the latter with two orange spots reduced in size by the mesal black spot plus inward extensions of the anterolateral black areas. Venter predominantly black, the sternites with white to yellowish posterior margins, especially on mesal third. Basal segments of ovipositor shining black, the valves light yellow, slender and acuminate, almost as in *A. arizonensis* Cole (cf. Cole, 1919, Trans. Amer. Ent. Soc. 45: plate 9, fig. 28). Legs predominantly light yellow, the coxae brown, a few faint brownish areas on femora and tibiae but apparently no definite pattern, the claws and distal half of fifth tarsal segment on all legs black. Squamae grayish. Halteres cream yellow.

Wings hyaline, veins strong, brown to black; venation approximately as figured for *A. sanguinea* (Sack, op. cit., plate 3, fig. 20), but the anterior branch of third vein continues to costa in full strength, the penultimate section of third vein is barely over one-third the length of its anterior branch, and the second vein is weaker than the others and incomplete. In the left wing the second vein is of almost full length, but is not joined at either end; in the right wing it is joined at its base, but fails slightly to reach the costa.

Length, 4 mm.

Holotype, female, Kisangara, at the south foot of the Usambara Mts., Tanganyika, Dec. 31–Jan. 1.

The species is very close to *A. trigramma* Loew from Central and Southern Europe, but the latter has complete second vein and yellowish scutellum. The wing resembles that of *A. nigrofemorata* Meigen (Meigen, 1822, Syst. Beschr. 3: plate 24, fig. 10), though the second vein is much longer in *lindneri,* and former species is quite distinct in other ways (black thorax, black femora, and reddish abdomen with a median row of small to medium-sized black basal triangles on segments two to four.)

The mesonotum of *lindneri* also resembles that of the North American *A. subfasciata* Westwood (cf. Cole, 1919, op. cit., plate

13, fig. 38), which, like *trigramma,* has complete second vein. It is a noteworthy fact in this family that in certain of the genera which are extremely widespread in distribution, the species of distant regions are often astonishingly similar.

Asteiidae

Asteia nitida Duda—Female, Msingi, 1400 meters, at southwest foot of Kilimanjaro, Tanganyika, May 1–19. This species was described from a long series of both sexes from Mujenje, Uganda.

Chloropidae

The only comprehensive publication on the Ethiopian fauna in this family is that of Becker (1910, Ann. Mus. Nat. Hung. 8: 377–443), now far out of date. However, the writer's review of the Chloropidae of the Ruwenzori Expedition of the British Museum (Nat. Hist.) (Sabrosky, 1951, Ruwenzori Expedition 1934–5, vol. 2, no. 7, pp. 711–828) contains keys to the Ethiopian genera of the two subfamilies, the Chloropinae (pp. 715–717) and the Oscinellinae (pp. 743–747), and keys for the Ethiopian species of a number of the genera.

The present collection is a small one but surprisingly varied, with the 34 specimens representing 23 or more species of eleven genera, of which three species and one genus are so unusually distinct that they are described as new.

With two exceptions, all specimens were collected in extreme northeastern Tanganyika, near the Kenya border. One female of *Mepachymerus tenellus* (Beck.) was taken at Dar-es-Salaam, Tanganyika, Dec. 11–20, and two males and one female of *Lagaroceras sequens* Beck. at Mombasa, Kenya, December 9th. Published locality records for most Ethiopian Chloropidae are few in number, and the following may therefore be of interest to record for the three principal localities at which collections were made:

Kware, a small stream southwest of Moshi, south of Kilimanjaro, Dec. 27–Jan. 21: *Pachylophus punctifemur* Sabr., *P. sp. near contractus* Beck., *Parectecephala varifrons* Lamb, *Lagaroceras pulchellum* Lamb, *Elachiptera (E.) occipitalis* Beck., *E. (Melanochaeta) scapularis* (Adams), *E. (M.) flavofrontata* (Beck.), *E. (M.) dubia* Lamb, *Rhodesiella subditicus* (Lamb), *R. aberrans* n. sp., *Siphunculina punctifrons* n. sp., *Kwarea pallidihirta* n. gen., n. sp.

Msingi, 1400 meters, at southwest foot of Kilimanjaro, Jan. to June: *Chlorops* sp., *Rhodesiella cuneata* (Becker), *Elachiptera*

(M.) vulgaris (Adams) (also collected at Ngerengere, Dec. 23), *Oscinella mesotibialis* Sabr., and two or three species of a difficult group of *Oscinella* with narrow wings, near *dimidiofrit* Beck. and *mesopleuralis* Sabr.

Ngaruka, west of Meru, Jan. 29 to Feb. 14: *Hippelates stigmaticus* Lamb, *Rhodesiella tarsalis* Adams, *Elachiptera (E.) simplicipes* Beck., *E. (M.) dubia* Lamb.

Hippelates n. sp. near *stigmaticus* Beck.

Male, Makoa, 1200 meters, at southwest foot of Kilimanjaro, Feb. 22–23. This specimen is apparently the same species as the female recorded by Sabrosky (1951, op. cit., pp. 751–752) from the Namwamba Valley, Ruwenzori Range in Uganda. A review of the still small amount of material which has slowly accumulated indicates that there are at least five distinct but closely related species in the Ethiopian region, but their sure differentiation is complicated by variation and by the sexual dimorphism, in some species but not in others, in the color of the third antennal segment. In *stigmaticus,* that segment is yellow in both sexes. In the Makoa male, however, the dorsal half is black, and, if I have correctly associated it with other material before me, the female of this species has the segment entirely black.

Pachylophus punctifemur Sabrosky, new status

Pachylophus proximus punctifemur Sabrosky, 1945, Proc. Zool. Soc. London 114: 459 (Mt. Meru, Tanganyika).

This was originally described from two specimens as a variety with predominantly yellow to orange legs and head. The study of additional material reveals that what appeared to be variation in the pollinosity of mesopleura and mesonotum is actually the consistent mark of a distinct species. The color of the hind legs is somewhat variable, perhaps due in part to maturity. The hind femur and tibia may be entirely black, or predominantly orange-yellow with an irregular black spot on the outer surface as originally noted.

The specimen from Mt. Elgon which I recorded as *P. proximus* in the Ruwenzori report (l.c., p. 718) is actually *punctifemur* with considerably darkened hind femur and hind tibia. I have also seen *punctifemur* from 925 meters at Kitembo, Belgian Congo [Inst. Parcs Nat. Congo Belge].

Proximus and *punctifemur* are similar in most respects, including the form of the head and frontal triangle, size of hind femur,

color of halteres, etc. They may be distinguished as follows:

Mesopleuron entirely polished, at most a tiny spot of pollen on the upper edge of the extreme posterodorsal angle; fore coxa and all femora black, except perhaps narrowly at knees and extreme bases; mesonotum predominantly shining black, sharply outlining the gray pollinose areas of narrow dorsocentral stripes, humeri, notopleura, anterior connections of humeri and stripes, and the narrow margins of the mesonotal suture .... *P. proximus* Adams

Mesopleuron with a distinct though small patch of gray pollen in the posterodorsal corner, the spot approximately equal in area to the polished triangular area on the cheek; fore coxa and fore and mid femora yellow, the hind femur variable in color; mesonotum with gray stripes, but with intervening areas dull brownish gray and the stripes thus not sharply distinct, the whole duller than the foregoing .... *P. punctifemur* Sabr.

Rhodesiella aberrans n. sp.

Rhodesiella of aberrant habitus, with somewhat depressed head and body, thorax with pale appressed hairs, long axis of eye diagonal, and wing venation unique in the genus.

Male, female.—Entirely shining black except as follows: Front along anterior margin, face, anterior portion of cheek, palp and antenna reddish to orange, the third antennal segment slightly browned along upper margin; legs including all coxae predominantly bright orange, the fore tibia and tarsus, distal segment of mid tarsus, and distal two segments of hind tarsus black, all femora with trace of infuscation above at the knees, and the hind tibia at its apex; halter yellow; wing clear, slightly infuscated narrowly along costal margin between apices of first and third veins; hairs and bristles of head and thorax whitish to pale yellow except for the outer vertical, posterior notopleural, postalar, posterior dorsocentral and apical scutellar bristles, which are black.

Head broader than thorax, and twice as broad as long; front slightly broader than an eye and .38 times the width of head, but obviously longer than broad; frontal triangle large, narrowly separated from eyes at vertex and nearly reaching anterior margin of front, its sides very slightly convex, but the curvature exaggerated by the rounded apex, the surface broken by longitudinal wrinkling on mesal two-thirds; each side of triangle with narrow flattened margin with row of about twelve short pale hairs set in minute punctures; front outside of triangle smooth and subshining, with

a few pale appressed hairs; nine to ten short reclinate orbitals on each side, about equal in length to hairs bordering triangle; ocellars and postverticals pale, short; outer verticals well developed. Eye bare, in profile the long axis diagonal and nearly 1.75 times the narrowest axis; front strongly sloping, twice the length of face, the height of head at base of antenna less than three-fifth its height at vertex; from directly in front, the flattening and broadening especially noticeable, the head being 2.6 times as wide as high. Cheek narrow, one-third the breadth of the small third antennal segment. Face concave, weakly carinate. Arista short pubescent.

Mesonotum approximately as broad as long, the disk posteriorly and the scutellum somewhat flattened, both densely covered with piliferous punctures, the hairs short, pale and closely appressed. Scutellum large, .8 times as long as broad at base, and slightly over one-third as long as mesonotum, scarcely narrowing, and broadly rounded at apex. Mesopleuron and sternopleuron in part roughened and covered with pale hairs like those of dorsum, also a cluster of pale hairs at site of propleural bristle above base of fore coxa. Prosternum large and heavily sclerotized, deeply grooved in middle. Chaetotaxy: 0 + 1 notopleural, 1 postalar, 1 posterior dorsocentral, and one pair apical scutellars, the latter set on slightly enlarged bases near the midline, and cruciate at tips; subapical scutellars pale and little stronger than discal hairs, but apparently two pairs close together on the broadly rounded posterior margin of scutellum.

Legs short and thick, the fore coxa and fore femur somewhat incrassate; hind tibia without sensory area.

Wing venation unique in the genus: First vein extending nearly to middle of wing, the costal cell broadened; second vein straight and short, third vein convex toward costa, fourth vein straight, ending at or a trace before the apex of the wing; costal sectors one (humeral crossvein to apex of first vein) to four as 20 : 16 : 13 : 5.5; marginal cell very narrow, submarginal cell slightly broader but narrower than usual; first posterior cell unusually broad, its width at level of hind crossvein over twice the combined width of marginal and submarginal cells; small crossvein at right angles to costa and slightly beyond middle of discal cell, the hind crossvein diagonal, penultimate section of fourth vein slightly longer than ultimate section of fifth.

Length, 3 mm.

Holotype, male, Kware, Jan. 17–21; allotype and one paratype (abdomen missing), Ruo, Nyasaland, April 13, 1916 (R. C. Wood). Holotype in Stuttgart Museum, allotype returned to

Commonwealth Institute of Entomology for ultimate deposit in the British Museum (Nat. Hist.), and paratype deposited in U. S. National Museum.

This species agrees with my generic characterization of *Rhodesiella* (Sabrosky, 1951, op. cit., p. 756) in having the eyes bare, surface of triangle glabrous (though roughened), postverticals erect and cruciate, ocellars proclinate and divergent (though shorter than usual), mesopleuron hairy, and no sensory area on the hind tibia. The aristal pubescence is much shorter than usual in the genus, the scutellum is broadly rounded and flattened rather than conical to subconical and convex, and I can see no trace of an anterior notopleural bristle. However, none of these are serious deviations from the characterization, especially when tendencies in other known species are considered. The flattened head and the wing venation do more to suggest another genus, but in my opinion they represent only one extreme of development in *Rhodesiella.* In the Oriental Region there are several species, such as *R. albicapilla* (Meijere) from Sumatra, which resemble *R. aberrans,* and others which approach it in some respects. Were one to propose even a subgenus for *aberrans,* which is a strong temptation because of its distinct habitus in the African fauna, I believe that one would find it increasingly difficult to define it as other species are brought into the picture, especially from the Orient.

Elachiptera (*Melanochaeta*) *dubia* Lamb

Two males, Kware, Dec. 27–Jan. 13; female, Ngaruka, Jan. 29–Feb. 14. This species was not included in the writer's key to the Ethiopian species (Sabrosky, 1951, op. cit., pp. 782–784), and in a footnote its probable position was erroneously indicated. I am indebted to Dr. F. van Emden of the Commonwealth Institute of Entomology for information which enables me to place it correctly. It is quite similar to, and in my key will run to the common *E.* (*M.*) *scapularis* (Adams), having the same black thorax with yellow humeri and propleura, but *dubia* is easily distinguished by having the ocellar tubercle polished, not pollinose, and by a small black anteroventral hind tibial spur, shorter than the diameter of the tibia at the location of the spur. It may further be noted that this species has a somewhat flattened scutellum suggestive of typical *Elachiptera,* but without distinct marginal tubercles at the bases of the bristles.

Siphunculina punctifrons n. sp.

Dull brown-gray pollinose species with polished black spot im-

mediately anterior to the median ocellus and considerable polished black areas on lower half of pleuron.

Male—Black except as follows: antenna except dorsal fourth to third, upper half of facial carina, large palp, fore coxa, ends of femora at the knees, all tibiae except for narrow median band on hind tibia and a less conspicuously marked band on mid tibia, and all tarsi except for brown distal segment, deep yellow; knob of halter pale lemon-yellow. Heavily gray to brown-gray pollinose except for the small polished spot on frontal triangle, the metanotum, and most of the lower pleuron, including the propleuron and lower portions of meso- and pteropleuron, all of which are smooth and polished black; face, cheek, upper half of pleuron, humerus and a suggestion of two sublateral stripes on mesonotum gray pollinose, the rest rather dark and dull brown-gray pollinose; abdomen sparsely and finely brown pollinose, subshining. Cephalic bristles and hairs bright yellow, except for the stout black postvertical bristles, which are well down on the occiput below the vertex and not easily seen; the 1 + 1 notopleurals, 1 postalar and two pairs of scutellar bristles short but stout and black; all mesonotal and pleural hairs short, but stouter than usual, yellowish, and rather conspicuous under the light, as described by Séguy for *S. aureopilosa.*

Frontal triangle large, equilateral, apex almost at anterior edge of front, the side margins scarcely distinct on the heavily pollinose front, approximately one row of small piliferous punctures on each half of the triangle. Front broad, over twice the width of an eye, and .56 times the width of the head, its length and breadth subequal. Cheek narrow, equal or less than diameter of a palp, less than half the width of third antennal segment, and one-tenth the height of the head; vibrissal angle nearly a right angle, not produced, the face approximately vertical. Facial carina short and strong, formed of a black, gray pollinose, triagular lower half and a yellow, slightly more elongate, triangular upper part, the apices of the two triangles meeting opposite the lower margin of third antennal segment. Eyes bare. Ocellar bristles erect and parallel, as short as hairs on triangle, bases well separated. Antenna small, third segment broader than long; arista microscopically pubescent, under high magnification.

Mesonotum with one or two rows of stout yellow hairs between the median and each dorsocentral row; mesopleuron with a few of these same stout hairs set in the gray pollen; disk of scutellum with short, black, appressed hairs. Scutellum of characteristic form, subquadrate, as broad across apex as across base, with four

stout black marginal scutellar bristles equally spaced at four angles on the posterior margin of the scutellum, the sides of the scutellum without bristles. Legs short. Wing clear, typical *Siphunculina* venation with short second costal sector and broadened first basal cell; second sector unusually short, only .7 the distance between the crossveins and one-fourth the length of the third sector; marginal cell extremely narrow, the second vein close to the first; submarginal cell long and broad, equal to or a bit wider than the first posterior cell; first basal cell broadened, equal to width of discal cell opposite it; small crossvein approximately at middle of discal cell, the cell not broadened distally, and the hind crossvein only very slightly oblique.

Length, 1.5 mm.

Holotype, male, Kware, Dec. 27–Jan. 13.

This species is quite near *S. aureopilosa* Séguy, described from Mt. Elgon in Kenya, having the same stout, short, yellow hairs and short second costal sector. However, besides the obvious character of the polished spot on the frontal triangle of *punctifrons,* the type of scutellum in *aureopilosa* is quite different, being subquadrate but narrow towards the apex, the apical pair of bristles well separated and on two angles of the hind margin, with two shorter subapical bristles along each side of the scutellum.

Kwarea n. gen.

Genotype: *Kwarea pallidihirta* Sabrosky, new species.

Subfamily Oscinellinae, with general habitus suggestive of some species of *Oscinella, Madiza* (*Siphonella*) and *Goniopsita,* but with distinctive chaetotaxy as follows: head bristles well developed, with both inner and outer verticals strong, three pairs of strong orbital bristles on upper half of front, ocellars proclinate and divergent, and the postvertical bristles straight, parallel and directed slightly caudad; 1 weak humeral, 1 + 1 strong notopleurals, 1 postalar, 1 posterior dorsocentral, and 1 apical and 1 subapical scutellar.

Frontal triangle not strongly delimited, the front outside the triangle shining; eye sparsely pubescent; face concave, with only a trace of median carina; cheek narrow, entirely pollinose, without dividing ridge; oral opening broader than long; proboscis short and fleshy; third antennal segment subreniform; arista pubescent. Mesopleuron without hairs. Scutellum short and broadly rounded as in *Oscinella,* the marginal bristles not on tubercles. Legs short and slender, the hind tibia with sensory area. Wing similar to *Oscinella;* first basal cell narrow, not broadened; hind crossvein

slightly oblique.

The relationship of the new species is not clear, but its characters are not consistent with any known genus, at least as currently conceived, and it seems necessary to erect a new genus for it. In my key to the genera of Oscinellinae (Sabrosky, 1951, op. cit., pp. 743–747), the combination of proclinate divergent ocellars and mesopleuron without hairs is found only in *Lasiopleura, Psilacrum* and *Stenoscinis* (in part), but *Kwarea* has little in common with those genera, except perhaps *Psilacrum*. *Kwarea* will key as far as couplet 11, which should be revised as follows:

11. Anal area of wing narrow, sometimes the anal margin almost paralleling the fifth vein; front with a distinctly narrow appearance, longer than broad .... *Stenoscinis* Malloch (in part)
Anal area of wing broad; front relatively short and broad, the breadth greater than or at most subequal to the length 11a
11a. Three pairs of strong orbital bristles on upper half of front; postvertical bristles straight, parallel, directed slightly caudad. *Kwarea* Sabrosky
Orbitals short, hairlike, scarcely evident; postvertical bristles cruciate .... *Psilacrum* Becker

Kwarea pallidihirta n. sp.

Small, shining black species with short, pale, appressed hairs on mesonotum.

Male—Head with anterior third or more of front, face, cheek, palp, antenna and base of arista yellow, otherwise black. Thorax black, polished, with a pale gray prealar patch of pollen over the notopleuron, narrow adjacent areas of notum, and upper corner of mesopleuron, a narrow band of gray pollen on middle of mesopleuron, gray pollinose postalar callus, and darker gray scutellum; metanotum smooth, polished black. Abdomen brown, sparsely pollinose. Legs predominantly yellow, marked with brown, including an area on distal third of each femur, narrow band on basal third and a suggestion of a band on distal third of each tibia, all markings darker and broader on the hind leg. Wing clear, veins brown. Halter yellow. Bristles black except for the pale and weak humeral bristle and vibrissae; hair of front, mesonotum, and scutellum short, pale, appressed.

Head broader than thorax; front approximately twice the width of an eye and as long as broad at the vertex, narrowing slightly anteriorly; front shining (the German "fettglänzend"), the frontal triangle poorly delimited, two-thirds the length of the front, smooth

and polished; ocellar tubercle obscurely dark pollinose, with a small area of pollen extending anterolaterad from it on each side of the median ocellus; eye large, in profile occupying most of the head; cheek narrow, one-third the breadth of the third antennal segment; palp large, projecting anteriorly beyond the oral margin (possibly only a male character!).

Mesonotum rather thickly set with fine piliferous punctures, which scarcely interrupt the shining appearance. Scutellum as in *Oscinella,* short and broadly rounded, two-thirds as long as broad, the apical bristles well separated at their bases, and cruciate at tips, each 1.67 times as long as a subapical bristle, the latter inserted midway between the apical bristle and the base of the scutellum.

Wing venation similar to *Oscinella;* second and third veins gently curving toward costa, the fourth straight and ending at apex of wing, the third and fourth weakly divergent, especially on distal half; length of costal sectors two to four as 18:8:6.5; discal cell short, widening slightly distad, the fore crossvein beyond the middle of the cell; distance between crossveins slightly greater than penultimate section of third vein but only two-thirds the length of ultimate section of fifth vein.

Length, 1.5–1.75 mm.

Holotype and paratype, both males, Kware, Jan. 17–21, the type also bearing a handwritten label "17.I.52. Bei Baumtermiten." Holotype in Stuttgart Museum, paratype in U. S. National Museum.

Note on Catocala clintoni Grt.—On a short trip to the Ozarks with friends, I was fortunate enough to capture a female of *Catocala clintoni* at Hot Springs, Arkansas on May 24, 1953. The moth was pretty well worn and weak, but I secured a few eggs anyway. The weather was hot, always in the nineties. I kept the eggs as cool as I could while travelling, but they hatched on May 30 or 31 and died before I discovered them. Nor did I know the food plant at the time, so it is doubtful that I would have been able to keep them, considering the heat and lack of facilities. Mr. E. A. Dodge in describing the life history (Can. Ent. XXXIII, p. 221, 1901) fed larvae on plum, but added that he later found a mature larva on apple. His ova laid over from June 21, 1900 to April 17, 1901. This seemingly premature larval emergence from my specimen is not without precedent, for my friend, Mr. V. G. Sasko had a similar experience with eggs of *Catocala sappho* a number of years ago.—Alex K. Wyatt, Chicago, Illinois.

APHID RECORDS FROM UNITED STATES AND CANADA.

By George F. Knowlton, Logan, Utah.

Some Washington Aphids on Lambsquarters: During the season of 1947, E. W. Davis and B. J. Landis collected the following aphids on *Chenopodium album* in the state of Washington: At Cowiche on May 27, *Macrosiphum solanifolii* (Ashmead), *Myzus persicae* (Sulzer), and on May 21, *Pemphigus populiramulorum* Riley alates and *P. balsamiferae* Wms., besides numerous *Landisaphis davisi* K.-M. aptera. On July 9 and 10 at Toppenish, *Aphis rumicis* L. and *A. medicaginis* Koch were collected, besides *Hyalopterus atriplicis* (L.) and alates of *A. gossypii* Glover.

A few Washington Aphids: Among the aphids collected in the state of Washington during 1947, by B. J. Landis and E. W. Davis, were the following:

Aphis gossypii Glover on wild parsnip at Union Gap, July 10.

A. heraclella Davis on wild parsnip, Union Gap, July 10.

Amphorophora nervate (Gill.) on wild rose at Cowiche, May 27.

Hyalopterus arundinus (Fab.) on prune at Union Gap, November 7.

Macrosiphum escalantii Knlt. At Union Gap, November 7.

M. dirhodum (Walker) on potato at Thrall, July 17.

M. eoessigi Knlt. on hollyhock, Union Gap, June 6.

M. katonkae Hottes on *Lactuca* at Union Gap, July 10.

Monellia caryae (Monell) on walnut, Union Gap, July 10.

Myzocallis robinae Gill. as accidental alates on potato, at Union Gap.

Phorodon humuli (Sehr.) on apricot and peach at Union Gap, September 12.

Pterocomma populea (Kalt.) as alates on potato at Toppenish, May 28.

Rhopalosiphum pseudobrassicae Davis on cabbage and broccoli at Union Gap in July.

R. berderidis (Kalt.) on barberry at Union Gap, June 6.

Clavigerus bicolor (Oest.). An accidental alate was taken on apricot at Union Gap, November 11.

Aphis armoraciae Cowen was taken by the writer on yarrow at Prosser, June 18, 1939.

Some Aphid Records: Recently Professor M. A. Palmer examined and identified a number of aphids from my collection. A few of the more interesting records would include the following:

Amphorophora davidsoni Mason. On *Rubus parviflorus*, University of British Columbia, Vancouver, Canada, June 28, 1950 (R. Stace-Smith).

A. masoni (Knowlton). On *Helianthus annuus*, Pleasant Grove, Utah, July 9, 1947.

A. maxima Mason. *Rubus parviflorus*, University of B. C., Vancouver, Canada, June 15, 1950 (R. Stace-Smith).

A. tigwatensa Hottes. Blackberry, Glacier Ntl. Park, Montana, July 23, 1946.

Aphis armoraceae Cowen. Alate on *Sphaeralcea*, Marble Canyon, Arizona, June 16, 1949.

A. coweni Palmer. On false hellibore, Mirror Lake, Uintah, Mts. Utah, August 6, 1949.

A. fabae Scopoli. On tiesel, Brigham, Utah, June 13, 1947.

A. fitchii Sanderson. Violets, Ogden, Utah, June 24, 1950.

A. maidi-radicis Forbes. On *Bassia hyssopifolia* at Mills Junction, Utah, September 8, 1949.

A. menthae-radicis Cowen. On mountain laurel, Zion National Park, Utah, August 5, 1949.

Collected by the writer except where otherwise indicated.

Capitophorus Aphid Records: *Capitophorus gillettei* Theo. was collected on *Polygonum* at Toppenish, Washington, July 9, 1947 (B. J. Landis). *C. gregarius* K. on *Chrysothamnus*, Logan Dry Canyon, June 13, 1944 (Knowlton—S. L. Wood). *C. longinectarius* G.-P. on *Artemisia tridentata* at Moran, Wyoming, July 19, 1936 (Knowlton). *C. packi* (K.) on *Chrysothamnus nauseosus* at Oak Creek Canyon and Eureka, July 1942, Ephraim Canyon, September 6, 1945, and on *Chryso. greeni* at Kanab, August 10, 1936, in Utah, and at Emigrant Pass, Nevada, July 12, 1944 (Knowlton). *C. potentillae fragaefoliae* (Ckll.) on cultivated strawberry, Grants Pass, Oregon, November 13, 1933 (R. Dimick): on wild *Rosa*, Trail Creek, 10 miles south east of Bozeman, Montana, July 31, 1942 (H. F. Thornley); on strawberry, Union Gap, Washington, July 21, 1947 (B. J. Landis). *C. sporadicum* (K.) on *Chrysothamnus nauseosus*, Brigham Canyon, Utah, October 3, 1928 (Knowlton). *C. zerozoous* K.-S. on *Artemisia tridentata* at Bear River City, Utah, August 10, 1927 (Knowlton).

NEW SYNONYMY IN DIPLOTAXIS (COLEOP., SCARABAEIDAE).

By Patricia Vaurie,[1] New York, N. Y.

During the course of a study of the species of the North American genus *Diplotaxis* (subfamily Melolonthinae) found in north central Mexico and southwestern United States, many species from other regions in these countries and in Central America were also examined. Comparative study of this material revealed a number of synonyms, but only synonymy of forms found in the United States is discussed in this paper. Examination of the large series of *Diplotaxis* in the American Museum of Natural History (over 10,000 specimens from Mexico alone) has shown that individual variability in the genus is far greater than was hitherto supposed; therefore many forms which were described on but one or two specimens are now found to be no longer valid.

Diplotaxis is an exceedingly difficult genus taxonomically, the 150 or more species being all unicolorous (black or reddish or buffy), without pattern, of the same general shape, and with most the distinguishing characters either relative, inconstant, or difficult to see. Some species are pubescent dorsally, the majority are glabrous, some few have nine instead of ten antennal segments, a few have a chitinous ridge laterally on the abdomen, some have thick hairy pads on the tarsi, some have the labrum bilobed, and in some species the males have distinctive secondary sexual characters.

Through the courtesy of Dr. K. Delkeskamp of the Zoologisches Museum in Berlin, the 27 types of Moser's Mexican species described in 1918 and 1921 were made available for comparison, and I am very grateful to Dr. Delkeskamp for this opportunity. I also wish to thank Dr. P. J. Darlington, Jr., of the Museum of Comparative Zoology, for comparing the types of some of Fall's species and for giving locality data on others, and Dr. M. A. Cazier of the American Museum of Natural History for criticism and suggestions made in a reading of this paper.

Diplotaxis ingenua Fall

Diplotaxis ingenua Fall, 1909, Trans. Amer. Ent. Soc., vol. 35, p. 65, pl. 1, figs. 32, 34.

Diplotaxis rufocastanea Moser, 1918, Stettiner Ent. Zeit., vol. 79, p. 307. (New synonym.)

[1] American Museum of Natural History.

Diplotaxis fusca Moser, 1918, *Ibid.*, vol. 79, p. 312. (New synonym.)

Diplotaxis futilis Fall, 1932, Jour. New York Ent. Soc., vol. 40, p. 194. (New synonym.)

Type locality, Huachuca Mountains, Arizona. Type in Museum of Comparative Zoology. Distribution, Arizona and northwestern Mexico.

This is one of the small glabrous species with the claws abruptly bent and toothed subapically, the clypeus slightly emarginate, its angles rounded, the labrum densely punctured and somewhat hollowed out, the pygidium grooved behind. Fall's *futilis* was described from a single specimen from Nogales, Arizona. A homotype from the same locality has been compared with two homotypes of *ingenua* Fall from the Pinal Mountains, Arizona, and with 18 topotypes from the Huachuca Mountains, and with many other specimens from Arizona, Sonora, Chihuahua, and Durango. Although these specimens show considerable individual variation in color, in the shape of the pronotal margins, in the punctuation of the scutellum, pygidium, and abdomen, and in the degree of tumidity (when present) of the abdomen, they appear to represent but one species, *ingenua.*

Examination of the types of Moser's *rufocastanea* and *fusca* (type locality of both forms, Mexico) shows them to be also this species. The only difference between these two specimens, other than the slightly smaller size of the former (8 mm. instead of 8.5), is that the type of *rufocastanea* is a male and therefore, as is true of males and females in certain groups of *Diplotaxis,* has the pygidium somewhat more transverse than in the female, and with its apex rounded, less pointed. The pygidium is also retracted in the male and the fifth abdominal segment at center is shorter than the fourth, whereas in the female these segments are about the same length. Moser's descriptions of these two forms, although separated in his paper by the descriptions of five other species, read virtually the same except for two statements, one that the labrum is shallowly hollowed out in *rufocastanea* and the other that the second abdominal segment in *fusca* has a swelling each side of the middle. Examination, however, proves that both types possess these characters. The tumidity of the abdomen is lacking in most specimens of *ingenua* from the United States, but this is not always a reliable character in *Diplotaxis.*

Diplotaxis punctatorugosa Blanchard

Diplotaxis punctatorugosa Blanchard, 1850, Catalogue . . . ento-

mologique . . . Paris, vol. 1, p. 171.

Diplotaxis excavata LeConte, 1856, Jour. Acad. Nat. Sci. Philadelphia, ser. 2, vol. 3, p. 267. (New synonym.)

Diplotaxis frontalis LeConte, 1856, *ibid.*, vol. 3, p. 268. (New synonym.)

Diplotaxis densicollis Fall, 1909, Trans. Amer. Ent. Soc., vol. 35, p. 52. (New synonym.)

Type locality, Savannah, Georgia. Distribution, on the coast from South Carolina to Texas, also Oklahoma; Rhode Island (one specimen).

Although the types of these species have not been examined I feel sure, from the evidence given below, that they are all the same species, varying only in the density and rugosity of the pronotal punctures and in the presence or absence of a "rather broadly and deeply concave or impressed" area (Fall, p. 51) exteriorly on the basal margin of the pronotum, this area either opaque or glabrous. There is also some slight variability in the size and extent of the transverse ridge on the front of the head, but the ridge is always present. The type locality of *excavata* is either South Carolina, Georgia, Florida, or Louisiana (none was designated by LeConte); of *frontalis*, Georgia; of *densicollis*, South Carolina.

In Leng's catalogue (1920, p. 255) Blanchard's *puncatorugosa* appears at the end of the list of *Diplotaxis* without number, probably for the reason that Fall in his 1909 revision, after his discussion of *excavata, frontalis,* and *densicollis,* remarks that "the *punctatorugosa* of Blanchard is almost certainly one of these, but it is impossible to say which." Since the three forms are now considered as the same species they are therefore all referred to *punctatorugosa.* This is the only small eastern species in which the front of the head behind the clypeus is "transversely carinate" (Blanchard), the carina "medially impressed" (Fall). It is also the only eastern species with such a deep and definite impression at the base of the elytra within the humerus, and with the elytral punctuation so coarse, dense, confused, and rugose that the costae are "rather inconspicuous" (Fall). The labrum is also unique, at least among the small eastern forms, in its absolutely flat surface which is strongly, densely punctured and is on the same plane as the underside of the clypeus. As Fall remarked in his discussion of *frontalis* (p. 51), "there is no possibility of confusing this species with any other except the two following [*excavata, densicollis*], one or both of which may indeed be only varietal forms of the present."

The pronotum with its large bulbous swelling at the sides at middle and its sinuation in front of the basal angles (when seen from above) is quite similar to the pronotum of some *subcostata* Blanchard (type locality, Savannah, Georgia), a species occurring in many of the same areas. The latter differs, in addition to the characters already stated, in its larger size (usually 11 mm. or more), virtually non-punctate scutellum, proportionately shorter clypeus, and by having the pronotum more narrowed in front. The claws in both species are bent and subapical.

A total of 60 specimens of *punctatorugosa* has been examined, including two homotypes of *excavata* (South Carolina, Florida), one homotype of *frontalis* (Meredith, South Carolina), and one of *densicollis* (Mt. Vernon, Alabama). In a series of 25 specimens from Beaufort, South Carolina, 11 are the glabrous variety (*frontalis*), the pronotum having "at most a very broad and feeble impression along the basal margin;" the 14 others have this impression not only deeply concave but also pruinose or opaque (*excavata* and *densicollis*), the pruinosity sometimes extending all the way across the base of the pronotum. This character is not sexual. In *hebes* Bates and an undescribed species from Mexico, with but nine segments in the antennae, both glabrous and pruinose individuals occur throughout the range of the species.

The pronotal punctuation in 24 of the 25 Beaufort specimens and in 15 others (Alabama, Mississippi, Louisiana, Florida, South Carolina, Texas), including the homotypes of *excavata* and *frontalis,* is very irregular, being generally much sparser on the disc at center and denser on the sides, but varying individually not only in the number of denser areas, but also in their location. Of the 18 remaining specimens, 14 (homotype of *densicollis,* 4 from South Carolina, 8 from Mississippi, one from Beaufort) have the pronotum so densely punctured and rugose that there are scarcely any smooth areas without punctures (one of the specimens, however, has the basal margin of the pronotum virtually unimpressed as in *frontalis*), one has the punctuation rather sparse, and three have it denser, but not quite so dense as in *densicollis* (one of the latter specimens also has the base deeply and opaquely excavate). The specimen from Rhode Island (Watch Hill) is of the *densicollis* form. The above evidence seems to show that intermediate individuals do occur among the three described forms (Fall had not seen any) and that they are all varieties of the same species.

The *brevidens* group

This is a small group of *Diplotaxis* species of medium to large

size (10 to 14 mm.) in which the males have long and abundant golden hairs on the inner side of the femora and tibiae and down the center of the abdomen. The tibial hairs can readily be seen on mounted specimens without the aid of magnification. The females, although lacking the abdominal patch of hairs, have long but much sparser hairs on the legs. Five forms in this group of species have been described but only three appear to be valid, *brevidens* LeConte, 1856 (type locality, Valley of the Gila, Arizona), *illustris* Fall, 1909 (type locality, Baboquivari Mountains, Arizona) and *fossipalpa* Fall, 1909.

Diplotaxis fossipalpa Fall

Diplotaxis fossipalpa Fall, 1909, Trans. Amer. Ent. Soc., vol. 35, p. 57.

Diplotaxis villosipes Fall, 1932, Jour. New York Ent. Soc., vol. 40, p. 193. (New synonym.)

Type locality, Phoenix, Arizona. Type in Museum of Comparative Zoology. Distribution, southern Arizona, southern California, and northern Sonora, Mexico.

In 1909 Fall had only females of *fossipalpa,* which he thought might prove to be the same species as *illustris* of which he had a male, but these two species are distinct as will be shown later. In 1932 he described *villosipes* (type locality, Holtville, California), on a single male, giving certain significant characters that he had not mentioned for *fossipalpa.* These characters were found to be present in two female topotypical homotypes of *fossipalpa* in the American Museum of Natural History and a further check on these characters through the kindness of Dr. Darlington at the Museum of Comparative Zoology shows that they are also represented in Fall's type of the species. Thus Fall's *villosipes* is the male of *fossipalpa.* The distinguishing characters, which are present in both sexes, are the round concavity in the center of the metasternum, and the exaggerated bulbous arc of the pronotal side margins. In *illustris* and *brevidens* the metasternum is evenly rounded as in other *Diplotaxis,* and the pronotal sides are not or scarcely sinuate before and behind the middle angulation, not prominently sinuate as in *fossipalpa.* The males of *fossipalpa* differ further from the males of the other two species, by having the ungual tooth on the claws of the middle legs obsolete or very tiny, and the femora and tibiae abundantly hairy on all legs, not just on the front and hind legs.

The following specimens of *fossipalpa* have been examined: from

Phoenix, Arizona, 2 ♂, 5 ♀; from California: Blythe, 1 ♂, Palm Springs, 2 ♂, 3 ♀, Holtville, 1 ♂, 1 ♀, Cochella, 1 ♂, San Diego County, 1 ♀; from Mexico; Sonora: Puerto Penasco, 5 ♀.

Diplotaxis brevidens LeConte

Diplotaxis brevidens LeConte, 1856, Jour. Acad. Nat. Sci. Philadelphia, vol. 3, ser. 2, p. 272.

Diplotaxis laeviscutata Moser, 1918, Stettiner Ent. Zeit., vol. 79, p. 313. (New synonym.)

Type locality, Valley of the Gila. Type in Museum of Comparative Zoology. Distribution, Arizona and Sonora, Mexico.

The type of *laeviscutata* (type locality, Mexico), a male, has been examined and it agrees in all characters, including the male genitalia, with a male homotype of *brevidens* from Arizona and with 15 other male specimens from Tucson, Gillespie Dam, Phoenix, and Organ Pipe National Monument, Arizona, and with a male (dissected) from Tiburon Island, Sonora, Mexico. Only three females have been seen and these differ from the males by having the abdomen convex and without the center patch of longer hairs, the legs less hairy, the pygidium less transverse, and the first segment of the hind tarsi shorter than the longer of the tibial spurs, not the same length as in the males.

Moser placed his Mexican form near Fall's *illustris* (Arizona), which also has very hairy femora and tibiae on the front and hind legs. The two species are in fact closely related, and the females can scarcely be distinguished except for the generally smaller size of *brevidens* and the slight difference in the hind tarsal claws. The latter in *brevidens* are cleft nearer the middle and the tooth is placed more at right angles to the claw, seemingly without any fissure. The male of *brevidens,* however, has the hairs, especially on the abdomen, far less abundant than in the male of *illustris,* the abdomen not so strongly concave as in that species, the hind femora shorter, the genitalia not suddenly widened at the apex, and the front tarsi not fringed below with long sparse hairs. In series, a difference in the angle of the slope of the head can be discerned, and the punctuation of the second elytral interspace is usually more regular in *brevidens,* not confused as in most *illustris.* Both species are distinguished from *fossipalpa* Fall (Arizona, southern California, northern Sonora), which also has hairy abdomen and legs in the male, by the absence of a round depression in the center of the metasternum and by the definitely less sinuous sides of the pronotum.

JOHN L. SPERRY.

By A. L. Melander, Riverside, California.

John L. Sperry, lepidopterist, died on January 21, 1954 at the age of sixty years. Born and raised in New England Sperry early became interested in butterflies and moths. However, he was graduated from Brown Universiy, 1914, with the degree of Civil Engineer. He then accepted a position with the United States Reclamation Service and was stationed in Wyoming until World War I for which he volunteered as an engineer. After the war he returned to Providence as a member of the Water Supply Board of Rhode Island.

While at Brown University John met Grace Herreshoff, who was also interested in butterflies, although majoring in Geology. The two drawn together by their entomological interests married in 1919. After their marriage the Sperrys toured the United States back and forth, collecting moths and butterflies. They liked the Teton Mountains, Brownsville, Texas, Oak Creek Canyon in Arizona, and the Wallow Mountains, Oregon, returning to these western places now and again. In 1924 they moved to Redlands, California, and the next year picked Riverside as the city of their choice, purchased a house there, built a double laboratory in connection with their home, and gave their whole time to their insects, painstakingly mounting their catches and storing them in regimental order in large insect boxes. When the American fauna was becoming exhausted Sperry acquired much material from professional collectors elsewhere, particularly from South America. He purchased many books and journals, and bought microfilms of the rarer articles, so that his library was sufficient for the identification of his specialty, and ranks with that of many museums.

During World War II John freely volunteered his service on the Ration Board and daily sat at his desk issuing gasoline ration points to those whose needs required additional fuel. Because of his familiarity with the roads through the West it was not easy to bluff him into an allowance of extra gasoline. His service on the Ration Board was abruptly terminated by a heart attack, which hospitalized him for months.

Because spread Lepidoptera take up so much room, they early began to concentrate, Grace on the Noctuidae and John on the Geometridae. He began to specialize on genitalia, and filled boxes

with thousands of cleared mounts. They exchanged a great deal, sending specimens to the British Museum, the Canadian National collection, the American Museum of Natural History and to scores of lesser museums. The by-products of their collecting was freely given to specialists, tipulids to C. P. Alexander, Tabanidae to C. B. Philip, bees to C. D. Michener, and Neuropteroids to Nathan Banks, etc. The Sperrys were reluctant to achieve publicity, hence did not join many organizations, the Lorquin Society at the Los Angeles Museum being an exception.

After spending several summers in the Wallowa Mountains, Oregon, the Sperrys bought a ranch there. In 1950 they had gone to Walla Walla for some furnishings when Grace was stricken with a coronary thrombosis and died within ten minutes. At almost the same time Arthur J. Minor, Mathematical Engineer of Boston, who resided at Kingston, Rhode Island, died and his widow, Bertha Randall, a relative of Grace and early sweetheart of John, commiserated their losses and after a year married. John resumed his work which grief had interrupted, mounting his rapidly expanding collection of exotics and preparing slides of genitalia. During the next summer while at the Oregon ranch John had a second heart attack, and from then on had to forego violent exercise. No longer was he the expert tennis player, and mountain collecting was out. Bertha became a faithful nurse and mothered him through a progressive refractory anemia that followed.

For months John lived on borrowed time for he knew his days were numbered. His first thought was for his collection. Last Autumn he had F. D. Rindge come from the American Museum to pack his butterflies and moths, retaining only the Geometridae, and the boxes were shipped by van, as a gift from one of the most generous of men. He was getting one or two blood transfusions a week, after which he would become normal until the next. Even two weeks before he passed away he battled with income tax forms. One sunshiny day just before Christmas he drove us to Laguna Beach, and we never dreamed that the end would come in one short month. We shall miss him greatly.

EXCHANGES AND FOR SALE.

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Vol. XLIX JUNE, 1954 No. 3

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BULLETIN

OF THE

BROOKLYN ENTOMOLOGICAL SOCIETY

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NOTES ON THE GENUS LABOPS, BURMEISTER IN NORTH AMERICA, WITH THE DESCRIPTIONS OF THREE NEW SPECIES (HEMIPTERA: MIRIDAE).

By James A. Slater,[1] Storrs, Conn.

The genus *Labops* is composed of a rather homogeneous group of species that are quite distinctive from any related Nearctic genera within the subfamily Orthotylinae. Reuter (1883) erected the tribe Labopini for *Labops,* and certainly the genus has many features distinctive enough to appear to warrant at least tribal status. For example, the posterior wall of the bursa copulatrix is quite different in composition from any other orthotyline yet investigated (see Slater 1950).

Species of *Labops* may be recognized by the strongly pedunculate eyes that extend laterad far beyond the margins of the pronotum (Plate II, Fig. 3), the vertical head, slender condition of the third and fourth antennal segments and the strongly dimorphic condition of the hemelytral development.

Distribution:

Labops is Holarctic in distribution being found principally in northwestern North America and northeastern Siberia, with single species extending into eastern North America and eastern Europe respectively. The genus ranges through only the northern portions of both hemispheres. Judging from the descriptions and figures the Palearctic species are closely related to the Nearctic and form a rather homogeneous generic unit both morphologically and geographically.

[1] Department of Zoology and Entomology, University of Connecticut.

Host Plants:

Little is known of the biology of these species but it is evident that they feed upon wild grasses particularly those associated with arid conditions. Mills (1939) reports *Labops hesperius* feeding on *Koeleria cristata* (L.), *Poa secunda* Presl., *Stipa comata* Trin. and Rupt., and *Stipa* (?) *williamsi* Scrbn. in Montana. Mills (*ibid.*) also reports *hesperius* attacking *Hordeum* and *Triticum sativum*. Mills (1941) again notes *hesperius* on wheat in Montana. Gillette and Baker (1895) report *hesperius* on pine, but this surely is a "sitting" record. Mills (1938, 1939) notes *Labops hirtus* injuring wheat in Montana.

The male gonostyli (claspers) have previously been used as taxonomic characters in *Labops* by Knight (1922). In general the left gonostylus offers more reliable and easily utilized characters than does the right. However, the latter may be used if care is exercised in orientation.

The female structures have not previously been utilized for taxonomic discrimination although Slater (1950) described and illustrated differences in the posterior wall of the bursa copulatrix of *hirtus* and *hesperius*. The sclerotized rings appear to have limited value for specific separation. In contrast the posterior walls can be used to separate all of the known North American species with the exception of *hesperius* and *brooksi* where intergradation of characters is present. However, the most striking characters are found in a sclerotized area that extends mesally from an origin near the junction of the anterior rami and the connecting pieces (see Kullenberg 1947 and Slater 1950). This sclerotized area may be designated as the *inter-ramal bridge* and usually extends as a solid band with projecting spinous processes near the lateral extremities (Plate III, Figs. 15, 16, 17, 19), although in *chelifer* it is reduced to a pair of pincer-like lateral sclerites with no mesal connection, in *utahensis* it is a simple band of tissue and in *hesperius* and *brooksi* the area is completely membranous. This inter-ramal bridge presents remarkable specific characters and has the additional advantage of being much more easily utilized than the posterior wall (which is often difficult to dissect intact in this genus), and in not requiring extremely high magnification nor a high degree of accuracy in orientation.

Brachyptery:

Differences in the degree of hemelytral development are most interesting in this genus and show considerable variation from species to species. In *Labops verae* Knight only the brachypterous

condition is known in either sex. The hemelytra in this species are very short leaving several abdominal segments exposed and are truncate at the apex, the cuneus is undifferentiated and the clavus and corium fused into a single pad-like structure. It appears that *verae* has progressed furthest in brachypterous modification of any of the North American species. *Labops hirtus* Knight shows a predominance of brachyptery in both sexes. (Of the material I have examined 60 of 73 males are brachypterous; of 39 females 32 are brachypterous.) The brachypterous condition is quite different however from that of *verae,* in that the cuneus is well differentiated, and sometimes a slight trace of membrane is present and the hemelytra are much longer, covering almost the entire abdomen except for the two terminal segments and having the apices acutely rounded. In *L. hesperius* Uhler, *brooksi* n. sp., *tumidifrons* Knight and *burmeisteri* Stal the brachypterous condition is represented only in the females of the material I have studied. The following number of males have been examined without a single brachypterous specimen appearing: *hesperius* 46, *tumidifrons* 22, *brooksi* 79, *burmeisteri* 24. In the females of the above mentioned species brachyptery is the predominant condition, of material examined 84 females of *hesperius* show 68 brachypterous, of 69 *brooksi* 54 are brachypterous and the only 2 females of *tumidifrons* available are both brachypterous. The condition of the wings in short-winged individuals of these three species is similar to that found in *hirtus,* agreeing in the possession of a cuneus. However, the hemelytra at least in *hesperius* and *brooksi* are much shorter leaving 4–5 abdominal tergites exposed and the species are much more bluntly rounded with no indication of a membrane remnant visible. It is interesting that the species (*hirtus*) that Blatchley (1926) synonymized with *hesperius* is distinguishable in the brachypterous condition by the hemelyera alone in addition to all the other characters that have been utilized to separate the two species.

Immature Stages:

Apparently the immature stages have not previously been described in the literature.

Labops hesperius Uhler
(fifth instar nymph—in alcohol)

General coloration testaceous, marked with brownish as follows: frons on either side of midline and area about eye, this band extending about half way to meson along posterior margin of head,

clypeus, apices of lorae, labium, antennae, patch on lateral pronotal margin near center and extending irregularly mesad in area of calli, comma shaped mark near antero-mesal angle of developing wing pads, irregular longitudinal striping on wing covers, diffused area about dorsal abdominal scent gland opening, apex of abdomen, spotting on thoracic pleuron, coxae and trochanters, femora with a basal and subapical band; tibiae and tarsi entirely dark brown; a series of 5 brown spots along lateral margin of abdomen.

Clothed with prominent, erect dark brown hairs over body and appendages; hairs on hind tibiae not obscuring the true spines.

Eyes pedunculate and head strongly declivent as in adult, width across eyes 1.35 mm., interocular space .92 mm.; length pronotum .50 mm., width pronotum 1.06 mm.; mesothoracic wing pads extending caudad onto third abdominal tergite, narrow and divergent, not explanate at lateral margins, length wing pads 1.10 mm.; scent gland opening present between abdominal tergites 3–4; labium reaching metacoxae; basal segment of hind tarsus much shorter than second; antennae with third and fourth segments slightly thinner than segment two, length antennal segments I .32 mm., II .78 mm., III .53 mm., IV .78 mm. Total length 3.41 mm. Described from three specimens. 30 miles south Valentine, Nebraska, June 9, 1950. (Slater, Hicks, Laffoon.) Author's collection.

All three specimens available appear to be females so that it has been impossible to ascertain whether the inflated jugae, characteristic of males of the species are evident in the nymphs.

Key to North American Species of Labops

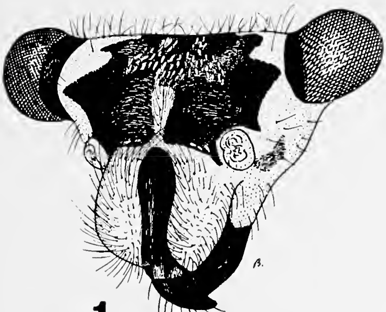
1. Hemelytra lacking upright, slender hairs, clothed only with flattened scale-like silvery hairs; head possessing a prominent transverse basal ridge; always brachyterous with the clavus, corium and cuneus fused into a single pad . . *verae*

   Hemelytra always possessing slender upright hairs, flattened silvery hairs usually present; head lacking a prominent basal ridge; both brachyterous and macropterous forms, but in latter case with corium, clavus and cuneus well differentiated . . . . 2.

Plate II

Fig. 1. Antero-lateral view of head of *Labops hesperius*. Fig. 2. Antero-lateral view of head of *Labops brooksi*. Fig. 3. Dorsal view of *Labops hirtus*.

BULL. B.E.S. VOL. XLIX PLATE II



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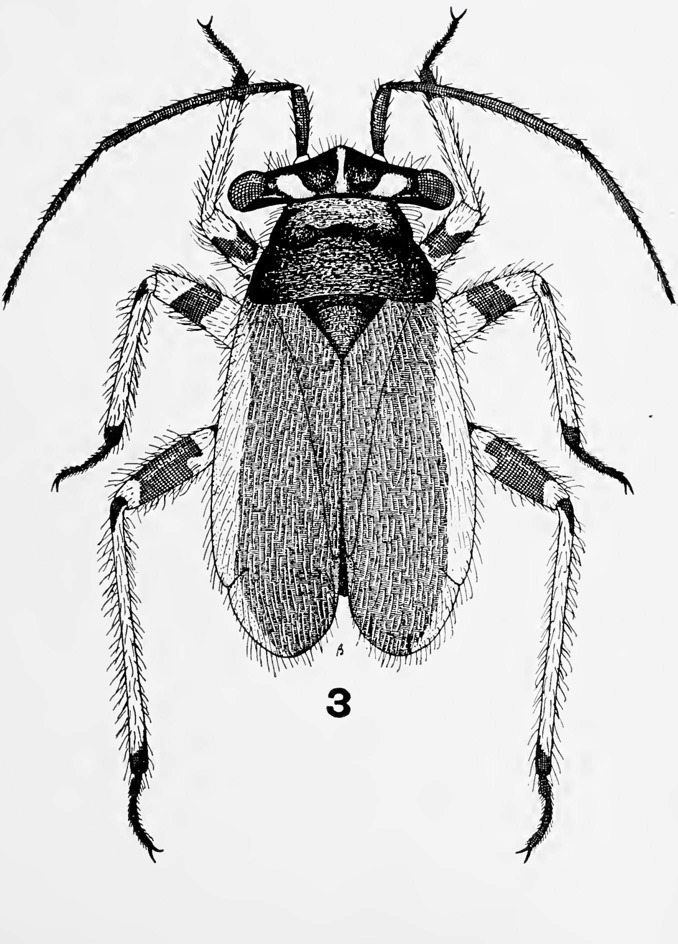


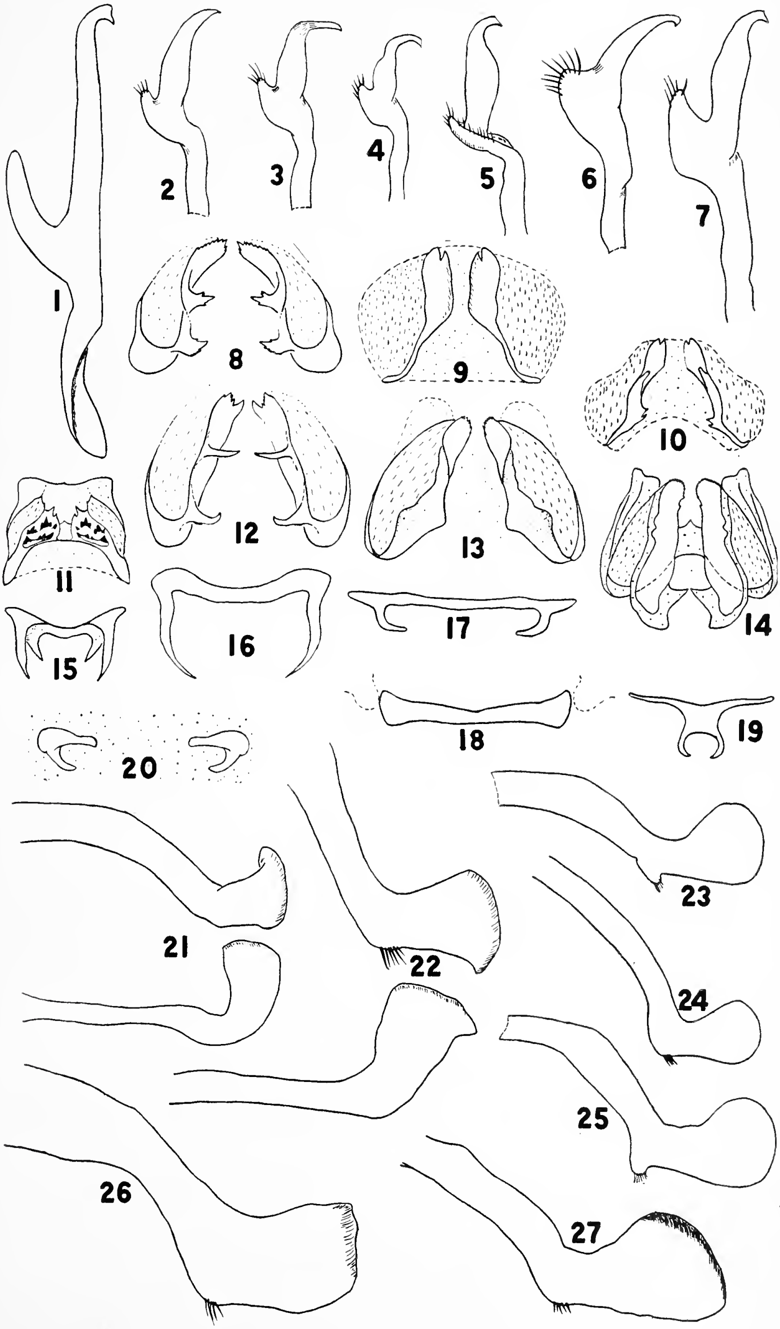
3

2. Hind tibiae completely black or extremely dark fuscous ... 3.
Hind tibiae never completely black, sometimes extensively darkened, but in this case partially reddish-brown or orange .... 5.
3. Jugae of males greatly swollen (Plate II, Fig. 1), with clypeus not visible between jugae from lateral view, of females less so, but still evidently tumid; left gonostylus evenly curving to apex (Plate III, Fig. 2) not strongly angled or straight for greater portion of length .... *hesperius*
Jugae of males not strongly swollen (Plate II, Fig. 2), clypeus visible between jugae from lateral view; left gonostylus sharply angled (Plate III, Fig. 3) before apex or straight for greater portion of length .... 4.
4. Length of first antennal segment as long as or longer than length of pronotum; labium reaching apex of hind coxae; third antennal segment one-fourth longer than segment four; large species over 4.7 mm.; female genitalia with inter-ramal bridge sclerotized and consisting of a simple mesally narrowed bar (Plate III, Fig. 18) left gonostylus of male very elongate, the shaft nearly straight throughout greater portion of length (Plate III, Fig. 1) ... *utahensis*
Length of pronotum greater than that of first antennal segment; labium reaching apex of mesocoxae; antennal segments three and four subequal in length; smaller species under 4.5 mm. in length; female genitalia with inter-ramal bridge entirely membranous; left gonostylus sharply angled near apex (Plate III, Fig. 3) .... *brooksi*
5. Lateral margin of corium black, unicolorous with remainder of hemelytron .... *burmeisteri*
Lateral margin of corium whitish or yellowish, always strongly contrasting with darkened median portion of hemelytron 6.
6. Hairs of hind tibiae very long, as long as or longer than the true spines and tending to obscure them; larger species over 4.0 mm. in length .... *hirtus*

PLATE III

Figs. 1–7. Left gonostyli of *Labops utahensis, hesperius, brooksi, tumidifrons, burmeisteri, verae, hirtus* respectively. Figs. 8–14. Posterior walls of bursa copulatrix *Labops brooksi, burmeisteri, chelifer, tumidifrons, hesperius, utahensis, verae* respectively. Figs. 15–20. Inter-ramal bridges of *Labops tumidifrons, hirtus, burmeisteri, utahensis, verae, chelifer* respectively. Figs. 21–27. Right gonostyli of *Labops burmeisteri, hirtus, brooksi, tumidifrons, hesperius, verae, utahensis* respectively.

BULL. B.E.S. VOL. XLIX PLATE III



Hairs of hind tibiae relatively much shorter, the true spines considerably longer and not obscured by the hairs; smaller species usually under 3.5 mm. .... 7.

7. Labium reaching, or nearly reaching apex of hind coxae; apex of scutellum light; female genitalia with inter-ramal bridge consisting of a pair of laterally placed, non-contiguous pincer-like sclerites (Plate III, Fig. 20) .... *chelifer*

Labium extending caudad only to mesocoxae; scutellum dark throughout; female inter-ramal bridge developed as a continuous band of sclerotized tissue with two pairs of caudally directed spines near lateral margins (Plate III, Fig. 15) .... *tumidifrons*

Labops brooksi n. sp.

Male—macropterous: Coloration bluish-black, marked with whitish as follows: explanate margins of hemelytra, area adjacent to eyes except for a narrow black lateral extension that reaches or nearly reaches the eyes above the antennal bases, jugae, short median area just above base of clypeus, bucculae, markings on coxae and sometimes incomplete striping on femora; antennae and tibiae completely black.

Clothed above and below with semi-erect yellow hairs, interspersed abundantly with decumbent scale-like flattened, silvery pubescence; first antennal segment and tibiae bearing prominent blackish spines, those on the tibiae distinctly longer than and not obscured by the hairs.

Head broad with typically pedunculate eyes, frons more tumid and less sloping than in *hesperius,* jugae not swollen, clypeus visible between them when viewed from side, width across eyes 1.35 mm., interocular space .93 mm.; pronotum rugulose, often with depressed area in region of calli, length pronotum .71 mm. (.64–.76), width pronotum 1.34 mm. (1.29–1.42), scutellum rugulose, convex at base, length .64 mm. (.57–.71); membrane exceeding apex of abdomen by distance caudad of tip of cuneus, maximum width across hemelytra 1.67 mm. (1.63–1.70); labium slightly exceeding apex of mesocoxae; length antennal segments I .57 mm., II 1.28 mm., III .64 mm., IV .64 mm. Total length 4.06 mm. (3.91–4.26).

Female—brachypterous. Similar to male in shape and color, often more strongly marked with whitish-yellow on femora; hemelytra strongly arcuate and rounded at apices, membrane entirely absent, leaving 3–4 abdominal tergites exposed; width across eyes

1.45 mm. (1.42–1.49), interocular space .99 mm.; maximum width across hemelytra 1.95 mm. (1.85–2.13); length scutellum .50 mm.; total length 3.65 mm. (3.55–3.76). Macropterous female—total length 4.37 mm. (4.12–4.83).

Holotype: Male: Manyberries, Alta. 4-VI-1952. (L. A. Konotopetz)—In Canadian National Museum Collection.

Paratypes: 79 males and 69 females. Alberta: Elkwater, Irvine, Spring Rt., Lethbridge, Manyberries, Cowley, Elkwater Park, Coults, Frank, Milk River, Conrad, Cardston, Morrin, Cochrane. Saskatchewan: Saskatoon, Beaver Creek, Glidden, Harris, Cypress Hills. Manitoba: Aweme. British Columbia: Rolla. Collected by C. P. Alexander, R. D. Bird, A. R. Brooks, H. E. Gray, L. A. Kelton (= Konotopetz), G. F. Manson, J. H. Pepper, H. L. Seamans, P. N. Vroom, R. M. White. Specimens deposited in Canadian National Museum, United States National Museum, British Museum, California Academy of Sciences, University of Connecticut, University of Massachusetts, H. H. Knight and author's collections.

This new species is very closely related to *hesperius,* the size, form and coloration are nearly identical in the two species. The males may readily be separated by the greatly swollen jugae of *hesperius* (Plate II, Fig. 1), in contrast the jugae of *brooksi* (Plate II, Fig. 2) are non-swollen and of the same type as found in the females of both species. The left gonostylus is also distinctive in the species, being much more sharply angled in *brooksi* (Plate II, Fig. 3), the right gonostylus while showing constant points of difference is more difficult to utilize due to the necessity of very accurate orientation to ascertain the small differences present.

Thus far I have been unable to satisfactorily separate the females of these two species other than by the slightly more swollen jugae in *hesperius.* The posterior wall of the bursa copulatrix while very distinct from other species of *Labops* (Plate III, Figs. 8 & 12) shows all degrees of intergradation in the two species and is unreliable for specific separation. The area of the inter-ramal bridge is entirely membranous in both *hesperius* and *brooksi* and is therefore not suitable for use in taxonomic discrimination.

I take pleasure in dedicating this new species to Mr. A. R. Brooks who has collected the greatest part of the type series and who first noted the jugal differences in the males of *hesperius* and *brooksi.*

(To be concluded in the October issue)

STUDIES IN THE MALACHIIDAE V.

By M. Y. Marshall, Murfreesboro, Tenn.

The present number of these Studies is largely the result of examination of some four thousand specimens of Malachiidae, belonging to the California Academy of Sciences. This material constitutes the bulk of the Academy's collection in this family, except for the genus *Attalus,* which I examined in connection with Studies III (1), and also includes the Ralph Hopping collection of Malachiidae.

Collops Erichson

Collops subaeneus Fall

In 1912 Fall (2) described this species from a unique female and the male has remained unknown, so far as I am able to determine, to the present time. I have a male specimen which I shall describe as the allotype of the species. A single female from Lake Town, Utah differs from Fall's type in having the prothorax entirely rufous, except for two small dorsal spots, about as in *bipunctatus* (Say) and the first two antennal segments entirely testaceous, with the remaining segments slightly infuscate. The clypeus and a trilobed frontal area also testaceous and the tarsi rufotestaceous.

Male. Similar to the female, except as follows. The reflections on the elytra especially toward the base are purplish rather than aeneous. The clypeus and the labrum are testaceous and there is a rounded yellow spot between the antennal foveae. The foveae are definitely larger than in the female and markedly narrow the anterior margin of the front. The antennae are piceotestaceous except for the two basal segments which are testaceous. On the first two pairs of legs, the distal tips of the tibiae and the basal joints of the tarsi are piceotestaceous. The first antennal segment is elongate triangular, viewed from the front, twice as long as broad, without teeth, the anterior surface strongly convex, the posterior concave or sinuate; the second segment very large, twice as broad as long, the posterior margin strongly produced, the tooth on the anterior face long and acute, the appendix heavy, elongate and curved at the tip; the third segment elongate triangular, pedunculate, twice as long as the following, which are strongly serrate. Length 4.0 mm.

Allotype, male, collected at Woodland, California, V-13-33, by E. C. Zimmerman, in the collection of the California Academy of Sciences.

Collops granellus Fall

This species very rarely has the elytral vittae completely divided rendering the specimen quadrimaculate. Such specimens may be distinguished from any of the normally quadrimaculate species by the fine tuberculation of the elytral surface and from *laticollis* Horn in that the apical spots extend to the apical margins of the elytra. One such specimen, in which the vittae are narrowly divided, is in my collection, from Culberson Co., Texas and one, in which the vittae are broadly divided, in that of the California Academy of Sciences, from Globe, Arizona.

Collops balteatus Leconte
Collops oklahomensis Brown (new synonymy)

C. oklahomensis was described by Brown in 1928 (3) from one male and one female collected in Payne Co., Oklahoma. He states that it "is more closely allied to *balteatus* (than to *validus* Horn, with which he also compares it), with which it agrees in elytral coloration and in the form of the second antennal segment in the male." He separates it from *balteatus* mainly by the fact that the pronotum in *oklahomensis* is bimaculate, whereas in *balteatus* it bears a large, undivided discal spot. This last statement agrees with that of Fall (2) who places *balteatus* in Group C of his key, in the section with "prothorax with discal black spot." Fall states: "I have seen but few specimens and these exhibit almost no variation." Evidently all of his specimens had the undivided prothoracic discal spot and all of his specimens were from Texas.

There is before me a series of 27 specimens of *balteatus,* from Texas, Alabama, Florida and Oklahoma. In 14 of these the discal spot is completely divided and in 13 it is either solid or incompletely divided. In most of the latter group the tendency to division is indicated by a more or less pronounced emargination of the anterior and posterior borders of the spot. In the three or four classed as incompletely divided, there is a narrow yellow median line which is not clearly marked throughout its length. In those which have the thorax bimaculate, the separation of the two spots varies from a narrow yellow median line to the condition described in *oklahomensis,* in which "each spot is separated from apical and basal margin and from the other by approximately half its width." This variation is parallel to that which exists in *vittatus* (Say), except that in *vittatus* it proceeds still farther and furnishes specimens with completely immaculate prothorax. The three specimens in the above series from Oklahoma all have the prothorax bimacu-

late with the spots narrowly divided. The color of the legs varies from entirely black to the bicolored condition described in the male holotype of *oklahomensis,* the heavier pigmentation of the legs being usually associated with a heavier pigmentation of the prothorax.

The only other differences noted by Brown are: "In *oklahomensis* the first antennal segment of the male is more elongate and the elytral punctures are slightly less coarse than in *balteatus.*" These differences appear to be well within the limits of intraspecific variation.

Collops simplex Marshall

In 1951 (1) I described this species from a unique male from California. I now have a female from California which I have compared with the male holotype kindly loaned to me for that purpose by the California Academy of Sciences and am satisfied that the two are conspecific. The specimen from the Ralph Hopping collection was labeled by him "Malachius sp. Fall can't name."

Female. Similar to the male, except as follows. The elytra lack the violaceous tinge of those in the male and are black, with the apical margins broadly and the lateral margins very narrowly testaceous, the apical pale margins extending for a very short distance along the suture. Broad lateral margins of the prothorax rufotestaceous. The first two antennal segments and the legs (femora excepted) paler than in the male. The head is more oval than in the male and more prolonged behind the eyes, which are much smaller. This gives the appearance of the head being longer, in proportion to the width, but actual measurements show that the length-width ratio is the same in the two sexes, i. e., 1.0. The entire upper surface is alutaceous, as in the male. The pygidium is rounded, with a minute apical notch, as in the male. The last abdominal segment appears to be completely divided in the midline. Length 4.0 mm.

Allotype, female, El Mirador, Tulare Co., California, Apr. 12, Ralph Hopping collection, in the California Academy of Sciences, with the holotype.

This specimen could only be confused with the female of *punctulatus* Leconte, which is the only other described North American species with the entire upper surface alutaceous. In *punctulatus,* however, there is no appreciable sexual difference in the shape of the head and the size of the eyes. Also, in those specimens of *punctulatus* in which the apical and lateral elytral margins have become entirely pale, as in *simplex,* the sutural margins are also

entirely pale. The last abdominal segment in *punctulus* is also completely divided, but the pygidium is broadly emarginate.

The marked sexual difference in the shape of the head and size of the eyes, a difference which I do not find in other species of *Collops,* creates the suspicion that I may be mistaken in associating the present female with the male of *simplex*. If so, further collecting will disclose the error which easily can be corrected.

Collops knulli Marshall

This species was described by the present author (1) from a single male collected in Gillespie Co., Texas. Two females are before me now collected at Bastrop, Texas, about 75 miles east of Gillespie County, one of which is herewith described as the allotype of the species.

Female. Similar to the male, except as follows. The elytral spots are narrowly separated. The antennae are unmodified and very feebly serrate. The last abdominal segment is completely divided and the pygidium is broadly truncate. Length 3.5 mm.

Allotype, female, Bastrop, Texas, VI-12-29. J. O. Martin, collector, in the California Academy of Sciences. One parallotype, same data, in the author's collection. The parallotype has the elytral spots narrowly confluent, as in the male holotype and the abdominal segments are slightly darker than in the allotype.

Both sexes of this species can be easily separated from our other quadrimaculate species of *Collops* by the following characters: small size, elytral spots confluent or nearly so, legs pale, head pale anterior to the front margin of the eyes, the pale portion not separated clearly from the adjacent dark portion, the elytra finely and densely punctured and conspicuously pubescent.

Tanaops Leconte

This genus, obviously derived from *Attalus,* is apparently recent and in a stage of active evolutionary development. The situation is much the same as in the genus *Omus* (Cicindellidae) with numerous imperfectly differentiated forms of limited distribution, a great amount of variation especially as to color and frequent "intermediate" specimens which are difficult, if not impossible, to place accurately. All this renders *Tanaops* the most difficult genus to study yet at the same time the most interesting group of the family in North America. Transitional or intermediate specimens, however, are valuable as indicators of the relationships between the various species.

In my 1948 key (4) to the North American genera of *Malachiidae* I stated that in *Tanaops* the antennae are inserted "on the front, the antennal foveae distant from the clypeal suture by almost or quite the diameter of a fovea," as in the genus *Malachius*. A closer examination of several of the species shows that this statement was in error, arising from the fact that the clypeal suture in *Tanaops* is either indistinct or quite invisible. The clypeolabial membrane appears to be always extended in *Tanaops* and feebly chitinized, so that it is incapable of retraction, as in the other genera. Where the clypeal suture is visible, it shows that the anatomical position of the antennal fovea is the same as in *Attalus*, i.e., "at the front margin of the front, near the sides and contiguous to the clypeal suture." Since several species of *Atalus* have elongate heads and other species of the same genus have ventral abdominal pits, the only real distinction between the two genera is the formation of the second male protarsal segments, which, in *Tanaops*, do not possess free lobes extending over the following segment.

Tanaops sexualis n. sp.

Male. Oblong, slightly widened posteriorly. Black, the elytra becoming piceous toward the apex, the elytral apices, the posterior half of the sutural margins, the anterior half of the lateral margins, prosternum, anterior trochanters, first three abdominal segments and the central portions of the fourth and fifth rufotestaceous. Head 1.5 times longer than broad, the front feebly triimpressed; surface shining, punctures and pubescence spare, extremely fine and inconspicuous, the punctures more dense in the frontal impressions. Antennae long, passing the prothorax by about three segments, moderately serrate, the outer edges of the intermediate joints not sinuate. *Prothorax* quadrate, 1.2 times wider than long, the sides parallel, the anterior margin moderately produced, all the angles rounded, the impressions just inside the posterior angles distinct, surface and vestiture as on the head, with a few short, erect, black setae along the lateral and anterior margins. Elytra shining, slightly scabrous, the punctures fairly dense and very minute, pubescence very short, fine and visible only in an oblique light, erect black setae numerous and evenly distributed over the surface. The apices are broadly pale, the sutural pale stripe extremely narrow, the lateral stripes somewhat wider. Ventral surface densely and finely punctured, the pubescence much more conspicuous than on the dorsum. Ventral pits on segments four and five large, coalescent, with a blunt median carina or elevation at

the bottom of each pair. Pygidium small, the apex truncate. Length 3.7 mm.

Female. Similar to the male, except as follows. Elytra more strongly widened posteriorly. Uniformly black or piceous black above, without the pale elytral markings present in the male; anterior half of the lateral elytral margins just perceptibly paler. Piceous black beneath, except for the pale prosternum and posterior margins of the ventral segments. Apices of elytra smooth. Antennae shorter than in the male, scarcely serrate. Ventral segments unmodified. Length 4.0 mm.

Holotype, male and allotype, female, Big Sur, Monterey Co., California. VI-18-33, L. S. Slevin collection, in the collection of the California Academy of Sciences. Paratypes in that collection and in the collection of the author.

Described from a series of 17 specimens, 9 males and 8 females, 15 with the same data as the types, two from the same locality, but collected VI-26-28.

The color dimorphism, which suggested the specific name, is largely but not exclusively sexual in nature. Four of the nine males are colored as in the female type, whereas only one of the eight females shows the pale elytral markings of the male type and in this specimen the pale areas are definitely darker in tint, piceo-testaceous and narrower, the pale sutural stripe being scarcely discernible. In the four otherwise normally colored male paratypes, the first three ventral segments are more or less heavily maculate or washed with piceous.

There are three other species with which the bicolored specimens of *sexualis,* mostly males, might be confused; *oregonensis, nunenmacheri* and *sierrae,* all described by the present author in 1946 (5). The first two of these are smaller species and in all three the males and females are similarly colored. In addition, the males of *oregonensis* are narrower and more parallel, the elytra are smoother and more shining and the prothorax is pale, with a narrow median stripe or spot. *Nunenmacheri* has the upper surface relatively dull and alutaceous, with practically no erect setae and the yellow markings are more extensive. The separation from *sierrae* offers more difficulties, since the two species are of the same size, shape and general appearance. Besides having the lateral elytral margins entirely pale, *sierrae* has the antennae more strongly serrate in both sexes and the male antennae at times have the intermediate segments moderately sinuate. So far as known, *sierrae* occurs only in the Sierra Nevada Mts., whereas *sexualis,* from Monterey County, is a coastal species. The unicolorous specimens, mostly

females, run to *coelestinus* in my 1946 key (5). This is also a smaller species, the elytra are bluish, granulate and with more conspicuous pubescence.

ANTHOCOMUS Erichson
Anthocomus horni (Fall)
Malachius antennatus Hopping (new synonymy)
Malachius rotgeri Marshall (subspecies)

This species is more variable both as to color and structure than existing literature would lead one to believe. The pale lateral thoracic stripes become narrowed in many specimens, giving a black thorax with narrow lateral margins pale. In some the thorax is entirely black. Likewise, the yellowish sutural angles of the elytra in both sexes become darker and the pale areas smaller until they are piceous in color and scarcely distinguishable from the rest of the elytra. In some, these areas disappear altogether and the elytra are black, with a faint aeneous or bluish luster. The smaller females of some of these dark specimens are easily confused with dark females of *mixtus* Horn and have been found mixed with the latter in several collections. They may be separated by the fact that the antennae are more strongly serrate in the females of *horni*.

Horn (6) and Fall (7), in their keys to the genus *Malachius*, both state that in *M. horni* (*spinipennis* Horn) the elytral appendages are not visible from above and the same statement appears in my key to *Anthocomus* (4), to which genus the species has been transferred. This is not true in a number of specimens that I find in the Hopping collection, especially those from the northern portion of its range in Oregon and British Columbia. Such specimens would run in my key (4) to *rotgeri* (Marshall) and a reexamination of the types of that species forces me to reduce it to the rank of a subspecies of *horni*. There are two series of *horni* in the Hopping collection, one seen by Fall in 1936 and designated by him as "new," the other set aside by Hopping and given a manuscript name. I was led astray by the previous statements of Horn and Fall as to the invisibility, from above, of the elytral appendages in *horni*, as were evidently also Hopping and Fall.

The Hopping collection contains two male and three female paratypes of *M. antennatus* Hopping, as well as five other females placed under this species, all from British Columbia. The only character of any consequence given by Hopping (8) to distinguish *antennatus* from *horni* is the form and length of the antennal pectinations. Horn (6) states that one of the two male specimens

from which he described the species *spinipennis* "has the antennae less distinctly pectinate" than the other and an examination of about 20 males of this species now available to me shows a considerable variation in the length and shape of the antennal pectinations, several of them having these pectinations equally as long and as distinctly clubbed as in the paratypes of *antennatus.* None of them, incidentally, has the pectinations as short and as broadly triangular as shown in Hopping's figure of the antennae of *horni.* I conclude that *antennatus* is a synonym of *horni.* The presence in my collection of specimens from Nevada, the antennae of which match those of *antennatus* almost exactly, would seem to preclude considering the latter as a subspecies.

Anthocomus mirandus (Leconte)

A series of over one hundred specimens in the Hopping collection demonstrates a degree of color variation in the female which has not been previously noted and which may cause some confusion in the matter of identification. Leconte (9), following his original description, states: "In the female there is a long common sutural spot, confluent each side with one extending nearly the whole length of the margin, forming a very wide band of greenish color," which he speaks of in the description as "fascia latissima e plagis tribus confluentibus composita." Leconte must have had a very unusually colored female before him, probably a single specimen, since among the seventy or more females in the present series, there is not one which displays such a fascia. Horn (10) states that the elytra are "variable in color from ocreous to blue, frequently the former color clouded with the latter." He says further that "in some unusually large specimens the aspect is that of *auritus.*" He must have had some other species than *mirandus* when he made this statement. At any rate, in examining a good many hundreds of specimens of *mirandus* in the past several years, I have never seen one which at all resembled *auritus.*

The present series shows the following. The males have the elytra luteous or pale clay yellow in color, the sutural edges very narrowly black and the apices rufotestaceous or orange colored. Very rarely do the males show the variation to be described for the females. In the majority of the females, the elytra are colored as in the males, except that the luteous portion is more or less "clouded," as Horn states, or washed with a fuscous or bluish tint. In a very few females the entire elytra are a bright orange. In a minority of the females, approximately 20%, the black sutural

stripe is more or less dilated and a black spot appears near the posterior end of the lateral margins. The extreme of this variation gives specimens, about 5% of the total, in which the elytra are bluish black, with a median yellow vitta on each. Such specimens are easily confused with normally colored females of *macer* Horn. *Mirandus,* however, is a larger species than *macer* and the female antennae are more sharply serrate. Similarly colored males, which do occur rarely, may be easily distinguished from the males of *macer* by the appendiculate elytra.

Anthocomus theveneti (Horn)

Malachius contortus Fall (12) (new synonymy)

The recent examination of several dozen males of *theveneti* from California has convinced me of the correctness of this synonymy which I have suspected for some time. My original set of *contortus* from Alberta, Canada was identified by the late F. S. Carr and I have subsequently received the same form from Montana (the type locality), Idaho, Washington and British Columbia. *Theveneti* was decribed from southern California, but typical specimens occur also in northern California, Oregon and Nevada. Although I have not seen Fall's types of *contortus* for several years, I have no doubt as to the correctness of the identification of the Alberta specimens, which agree in every respect with Fall's description.

The only characters which Fall (12) gives in his description of *contortus* which serve to distinguish it from *theveneti* are the serrate antennae (pectinate in the typical male of *theveneti*) and the almost completely dark thoracic disc. The series of male *theveneti* referred to above shows the antennae vary from rather feebly pectinate to strongly serrate forms with the latter condition being indistinguishable in this respect from typical *contortus.* The species should be included in both the "pectinate" and the "serrate" sections of any key to the genus and when placed in the "serrate" section it runs immediately to *contortus.* The degree of darkening of the prothorax is notoriously unreliable as a specific character in this family. In most of the specimens of *contortus* the elytra are black, although in the type series they are "deep blue," as in *theveneti.* The form *contortus* might properly be retained as a northern subspecies of *theveneti,* were it not that specimens of *theveneti* occur in the San Francisco bay area with all the distinguishing characters of *contortus.* A careful examination of the elytral appendages which are unusually complicated and distinctive reveals them to be identical in both forms.

It is rather odd to note that Fall states: "In form, size and sexual characters this species (*contortus*) is almost precisely like *uniformis*" [name changed to *falli* when the species was transferred to *Anthocomus*] (4), but he does not compare it with *theveneti;* whereas in his description of *uniformis* (*inornatus*) (7), he states that this species "is nearest *M. auritus* and *M. theveneti.*" A glance at the elytral appendages of *auritus* shows that species to be quite distinct from the others under discussion, but the elytral appendages of *uniformis* are indeed quite similar to those of *theveneti.*

Anthocomus minutus n. sp.

Male. Oblong parallel, the elytra slightly widened posteriorly. Black, with faint bluish or greenish reflections, depending upon the light, the labrum, genae, antennae and tarsi piceous, broad lateral prothoracic margins rufotestaceous. Head short, front bi-impressed, frontoclypeal suture indistinct, surface shining, no punctures or pubescence visible. Antennae strongly serrate, the intermediate joints five-sixths as wide as long, extending almost to the middle of the elytra. Prothorax transverse, 1.4 times broader than long, the sides parallel, the anterior border moderately produced, all the angles rounded, a strong depression just within each posterior angle; the wide black median stripe extending semi-circularly on each side into the pale lateral margin, in its middle third; surface shining, punctures and pubescence extremely fine. Elytra scabrous, the suture depressed, the punctures not visible, pubescence pale, prostrate and so fine as to be visible only in an oblique light, no erect setae present. Elytral apices smooth, tri-dentate, the middle tooth on each at the same level as the rest of the elytron, the two lateral teeth at a lower level; the appendages small, roughly triangular, their apices directed mediad, narrowly visible from above, their upper surfaces rather densely pubescent and with an antemedian rib or thickening; the process contorted, also directed obliquely mediad, almost reaching the tips of the appendages. Ventral surface shining, very finely and moderately densely punctate, the pubescence more conspicuous than on the dorsum. Lobes of the last sternite large, leaving a small penile opening. Pygidium truncate. Length 2.7 mm.

Holotype, male, collected at Kaweah, California, by Ralph Hopping (no date given); from the Hopping collection in the California Academy of Sciences. Female unknown. No paratypes.

This specimen had been set aside by Hopping and labeled *Malachius minutus,* but not described. I have used Hopping's specific

name. It also bears a label "*Malachius* n. sp., near *pristinus*," probably a determination by Fall. It resembles *pristinus* Fall superficially, but can be easily distinguished by the much more strongly serrate antennae, the absence of yellow elytral tips and the differently formed elytral appendages.

Anthocomus pusillus n. sp.

Male. Elongate, oblong, parallel, the elytra semicircularly dilated just before the apex, as in *horni*. Piceous black, faintly aeneus, the mouth parts (except the basal portions of the clypeus and labrum, the mandibles and terminal joints of the maxillary palpi), the genae, lower surface of the first two antennal segments, wide prothoracic margins and elytral apices pale testaceous, under surface and legs piceous, the tibiae and tarsi slightly paler and the posterior border and center of the abdominal segments testaceous. Head broad, the front triimpressed, the central impression foveiform, the eyes large and prominent, the tempora longer than usual in the genus and rapidly converging posteriorly, the surface strongly shining, punctures and pubescence sparse and extremely minute. Antennae rather long, reaching about the basal third of the elytra, strongly serrate, the segments slender, the intermediate ones two-thirds as wide as long. Prothorax 1.2 times wider than long, the anterior margin arcuately produced, the sides slightly converging posteriorly, the posterior margin and basal angles moderately reflexed, surface and vestiture as on the head. Elytra feebly scabrous, shining, the individual punctures not visible, the pubescence sparse, extremely fine, no erect setae present. Elytral apices unmodified, the pale areas large and angulate anteriorly. Ventral surface minutely and densely punctulate, the pubescence more conspicuous than above. Pygidium with the apex only about one-half the width of the base, the apex narrowly truncate, but with the apical angles rounded, sparsely covered with long yellow pubescence. Length 2.5 mm.

Holotype, male, Carrville, Trinity Co., California, VI-16-1913, no collector's label, in the author's collection. Female unknown. No paratypes.

This specimen has been in my collection for several years, identified as *blaisdelli* Hopping. When the opportunity recently arose, however, to examine Hopping's paratypes of *blaisdelli,* it was at once apparent that this was a distinct species. *Blaisdelli* is a larger species, with the antennae strongly and unquestionably pectinate. The antennae in *pusillus* might be described as feebly pectinate and

are, in fact, as much so as in some specimens of *theveneti* Horn, in which they are so described. I have thought it more accurate to describe them as strongly serrate. If placed in a key, however, *pusillus* should be included in both the "serrate" and "pectinate" sections.

Attalus Erichson

Attalus plumbeus Champion and *A. olivaceus* Champion

These two Mexican species, each described (11) from a single female specimen, are so similar that they cannot be separated with certainty by the characters given in the descriptions. They can, however, be separated without difficulty by the character of the terminal abdominal segment in the female. The species which I identify as *plumbeus,* on account of the smaller head, has this segment unmodified as in most other species of the genus whereas in *olivaceus* the tip of this segment shows a narrow, deep emargination, much as in *A. morulus* Leconte and *A. smithi* Hopping.

One of the four female specimens of *plumbeus* before me has the posterior thoracic angles narrowly rufous; in the other three the thorax is uniformly black, as in the type. Champion states that the males of both species are unknown. I have males of the species that I take to be *olivaceus,* but hesitate to describe an allotype without being able to examine the type, said to be in the Oxford Museum.

Attalus viridivittatus Champion

According to the description of this species (11), the type of which was a unique male, the prothorax has "an elongate triangular patch on the anterior portion of the disc" and this character is given prominence in Champion's key to the Mexican and Central American species of the genus. Of four males now before me, the prothorax is marked as in the type in two cases, while in the other two it is immaculate; five females all have the prothorax immaculate, or virtually so. The description and key are also somewhat misleading in describing the elytral vittae as green; they are rather black with a greenish tint.

Attalus piceus n. sp.

Male. Oblong, parallel, very slightly widened posteriorly. Color piceous, the under surface of the first two antennal segments, a minute spot to the inner side of each antennal fovea, labrum, genae, posteriorthoracic angles, narrow elytral margins, involving the entire lateral margin, apex and posterior two-thirds of the sutural

margin of each elytron, legs, except for a piceous dorsal stripe on the first two pairs of femora and the hind femora (exclusive of the knees) and the mesosternal epimera testaceous to pale testaceous. Head short, oval, 1.1 times wider than long, moderately produced behind the eyes, which are prominent; the surface shining, very finely and rather densely punctate and pubescent, two erect black setae on each tempus. Antennae slender, passing the thorax by about three segments, very feebly serrate. Prothorax transverse, 1.4 times wider than long, the sides parallel, all the angles rounded, the posterior angles slightly impressed; surface and vestiture as on the head. Elytra minutely rugulose, faintly shining, not metallic, finely and densely punctured, the pale prostrate pubescence rather dense but so fine as to be relatively inconspicuous; a few erect black setae in the neighborhood of the humeri. The common pale sutural stripe is slightly dilated in its anterior half. Ventral surface very finely and densely punctulate, the pubescence inconspicuous. Second protarsal segments projecting in a rather broad, flattened lobe over the third, concealing about one-half of the latter, their tips black and rounded. Pygidium small, bluntly rounded at the tip.

Female. Similar to the male, except as follows. The antennae are shorter and not at all serrate. The pronotum is completely margined with yellow, the margin widest at the posterior angles. The elytra are more testaceous than piceous, the dark disc having developed two wide oblique pale stripes, three piceous areas remaining, i.e., a common scutellar and postscutellar spot, an oblique stripe extending from the humerus to near the sutural apex and an elongate spot in the posterior half adjacent to the pale lateral margin. The pygidium is shaped as in the male, but is testaceous, except at the base. The anterior tarsi and last abdominal segment are unmodified. Length, male and female, 2.0 mm.

Holotype, male and allotype, female, S. E. slope of Mt. Colima, Mexico, XII-2-48. H. B. Leech, collector, in the collection of the California Academy of Sciences.

Described from a series of five males and three females, all with the same data. Paratypes in the California Academy of Sciences and the collection of the author.

The four male paratypes do not show any variation of consequence, except that one has the prothorax narrowly margined with yellow throughout and one has both thorax and elytra colored as in the three females. The three females show some variation in the relative amounts of brown and yellow on the elytra, but the pat-

tern remains the same.

The species is neotropical, from almost exactly the same latitude as Mexico City. It runs to *albomarginatus* Champion in Champion's key (11), described from a single male from an unknown Mexican locality. This species, however, according to Champion, has the elytra violaceous and the prothorax, "a lanciform mark on the disc excepted," testaceous. The pale male in the present series, which has the elytra more testaceous than piceous, still has the prothorax piceous, with only a narrow pale margin. It also resembles our North American *lobulatus* Leconte, but the paler specimens of *lobulatus* have the dark discal area of the prothorax definitely trilobed, the sutural stripe is more widely dilated toward its anterior end and the sexes are similarly colored.

The following distributional records are supplementary to those contained in Leng's Catalogue and Supplements and in Nos. III and IV of the present series of Studies.

Collops cribosus Lec., Oregon; *C. tricolor* (Say), Louisiana; *C. sublimatus* Schffr., Virginia; *C. punctatus* Lec., Texas; *C. dux* Fall, California; Sinaloa, Mex.; *C. claricollis* Fall, Utah; *C. subtropicus* Fall, Georgia; *C. nigriceps* (Say), Colorado; *C. floridanus* Schffr., New Jersey; *C. bipunctatus* (Say), Nevada; *C. limbellus* G. & H., Kansas, Utah; *C. marginellus* Lec., Colorado; *C. vittatus* (Say), Michigan, Massachusetts; *C. histrio* Er., Texas; *C. tibialis* Schffr., Sonora, Mex.; *C. femoratus* Schffr., Sonora and Sinaloa, Mex.; *C. quadrimaculatus* (Fab.), Ohio, Michigan, Mexico; *C. balteatus* Lec., Oklahoma, Lower California. *Temnosophus impressus* Sz., Alabama. *Tanaops basalis* Brown, Arizona. *Anthocomus auritus* (Lec.), Texas, British Columbia; *A. directus* (Fall), Arizona; *A. ulkei* (Horn), Montana; Ontario; *A. nigrinus* (Lec.), Oregon; *A. franciscanus* (Fall), Oregon, British Columbia; *A. bipunctatus* Harrer, Delaware. *Attalus grisellus* Fall, San Luis Potosi, Mexico.

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Robberfly preys on stink bug: A robberfly, *Promachus albifacies* Williston, was collected upon a wheat stem shortly after it had captured and started to feed upon a Say stink bug, *Chlorochroa sayi* Stal. This observation was made in a field of fall-planted dryland wheat in upper Erda, Tooele County, Utah, on July 3, 1953. The stink bug was still kicking weakly when predator and prey were captured with an insect net.—G. F. Knowlton and Wilford J. Hanson, Logan, Utah.

Chrysomelid on Willow: Large numbers of larval and adult Chrysomelidae beetles, identified by G. B. Vogt as *Plagiomorpha arizonae* (Cr.), were feeding on and damaging foliage of black willow trees near "Zion Village" on September 9, 1953. This was at Springdale, in southern Utah near Zion National Park. A moderate infestation of aphids, together with numerous predacious ladybird beetles, *Chrysopa* adults and their larvae, plus some syrphid fly larvae, also was observed on these trees.—George F. Knowlton, Logan, Utah.

STUDIES OF THE GENUS EMPOASCA (HOMOPTERA-CICADELLIDAE)—XIV. SOME NEW SPECIES OF MEXICAN EMPOASCA.

By Dwight M. DeLong[1] and Jose Guevara C.[2]

Many species of *Empoasca* have previously been described in this series of studies. Another group of six new species of Mexican *Empoasca* is described below. Of this number, three are green in color one of which, *comara,* has a bright red face. The other three species *anoteya, tepona,* and *tolinda* are mottled, spotted or banded and resemble in coloration species of *Erythroneura.* The types of all species are in the DeLong collection.

Empoasca callera n. sp.

An elongate greenish species resembling *fabae* in general appearance but with more produced head and distinct male genitalia. Length 4.5 mm.

Crown produced and bluntly pointed, about one and one-half times as wide at base between the eyes as medium length.

Color pale green with a pair of round, dark green spots on disc with light longitudinal areas between these spots and on the outer side of each. Apex and upper portion of face tinted with orange-yellow. Face pale green, clypeus dark green. Pronotum pale green, anterior half almost white. Scutellum pale green, the median half with a white longitudinal area. The elytra pale greenish subhyaline.

Genitalia: Female seventh sternite with posterior margin produced and bluntly angled. Male plates rather long, curved upward at apex caudad to pygofers. The styles are rather short, tapered, curved outwardly and pointed at apex. The lateral processes are long, narrowed at four-fifths their length and curved outwardly to form "S"-shaped apices which are slightly enlarged at the tip. The dorsal spine is broad, rather short and pointed on the anterior ventral margin. The aedeagus is long, rather slender constricted just before apex, then broadened with apex flat, transverse. A short anteriorly directed, pointed process arises just before the constricted portion.

Holotype male and paratype males collected at Puebla Pue, Mexico, October 18, 1941 (K-78) by DeLong, Plummer, Caldwell, and

[1] Department of Zoology and Entomology, The Ohio State University.

[2] Rockefeller Foundation, Mexico City, Mexico.

Good. Allotype female and female paratype from Zimapan Hdg. (17 mi. north) collected September 26, 1941 by Good, Caldwell, and DeLong. A male paratype from San Jacinto, Mexico D.F. was collected June 20, 1930 by Dr. Dampf.

Empoasca tepona n. sp.

Resembling a species of *Erythroneura* in appearance, with three pairs of conspicuous, black spots on pronotum and clavus of elytra. Male genital structures distinct. Length 3 mm.

Crown bluntly angled, one-third wider between eyes than median length.

Color pale yellowish, crown, face and scutellum unmarked. Pronotum with a pair of large, round, black spots on disc. Elytra with a pair of large, round, black spots on clavus, one either side of scutellum and a proximal pair at middle of clavus along commissure. There is a series of brown spots extending obliquely from costa to clavus just before the apical cross veins and the portion posterior to the cross veins is uniform brown except where the veins are broadly bordered with white.

Genitalia: Male styles long, greatly exceeding pygofer, and upturned at apex. The styles are elongate constricted near middle, the apex is tapered and pointed. The lateral processes are long, the apical half gradually tapers to a sharp pointed apex. The aedeagus is rather short and broadened apically where it is divided into two general parts both of which are bifid. The ventral portion is more narrowed and shorter and bifid at the apex. The dorsal portion is separated from the ventral portion by a broad notch and is directed dorsally. Its apex is broadly deeply notched forming a slender anterior process and a broader posterior process. The pygofer spine is long sickle-like with the apex directed ventrally and tapered to a sharp pointed apex.

Holotype male and paratype males collected at Ixmiquilpan Hgo., Mexico, September 27, 1941 by Caldwell, Good and DeLong.

Empoasca tolinda n. sp.

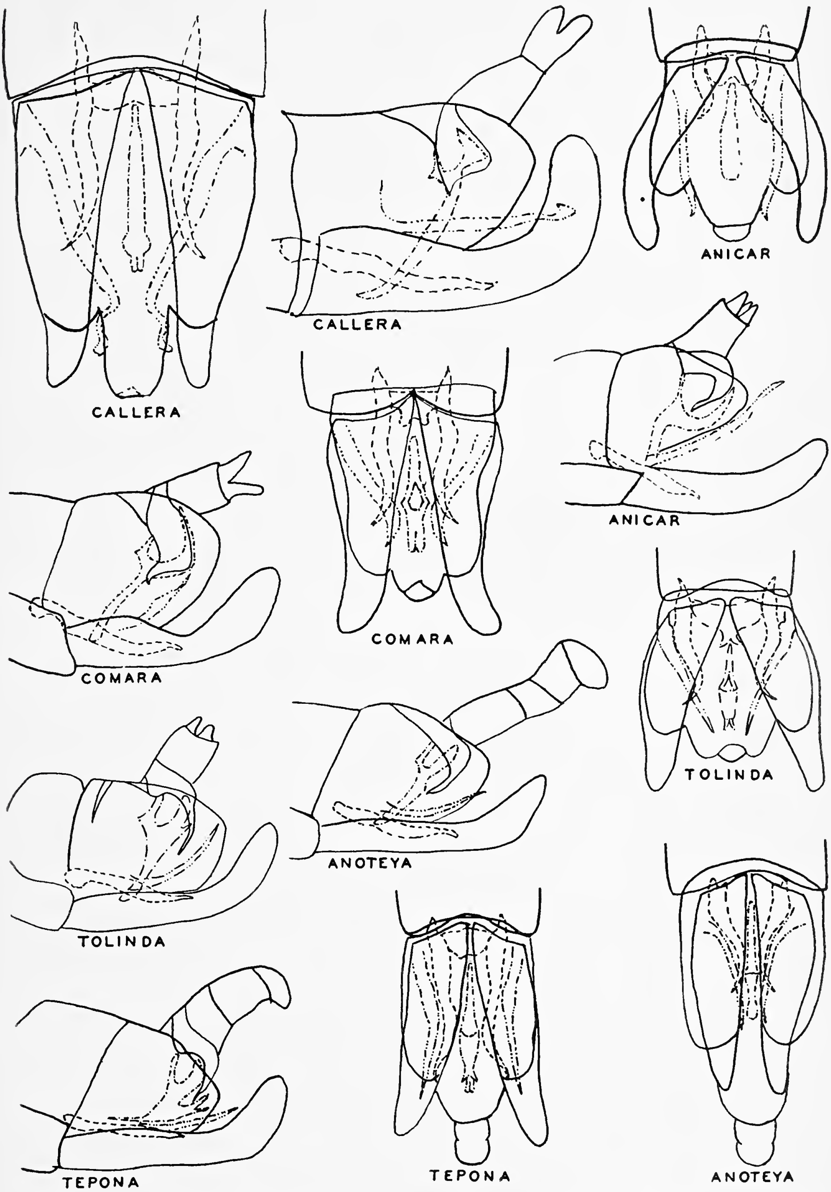
A small blunt headed species resembling an *Erythroneura* because of the color of its wings. The male genitalia are distinct. Length 3 mm.

Crown blunt in male about as long at middle as width between eyes at base. Crown appearing more produced in female, but the proportions of width to length are about the same.

Color: Male yellowish with brown markings. The crown is mottled with brown. The face, pronotum and scutellum are dark

Bull. B.E.S. Vol. XLIX

Plate IV



Lateral and ventral views of genital capsules of males as named showing position of styles, aedeagi and pygofer hooks.

brown. There is a slight pale spot at the anterior median portion of the pronotum. The elytra are flecked with yellow as in the elytra of *Erythroneura* of the *maculata* group. There is a broad, interrupted transverse band across the middle of each elytron. This coloration is dark on the costal margin and the claval portion. It is paler and interrupted on the median portion. The female is paler in color and may not represent the same species.

Genitalia: Female seventh sternite angularly produced on the posterior margin. Male plates long, rather slender, curved upward at the apex. Styles short, thickened at middle, tapered at apex to sharp-pointed tips and curved outwardly. Lateral processes long, narrow, tapered to sharp-pointed apices. The aedeagus is narrow at the base, broadened just beyond middle and deeply, broadly excavated on apical third forming an anterior dorsally directed process and a slightly broader posterior process which bears a short spine on its posterior margin at its base. The dorsal pygofer spine is long, its apical half is slender, tapered and pointed at apex which is directed ventrally.

Holotype male and allotype female collected at Orizaba Veracruz, Mexico (K-280), October 17, 1941 by DeLong, Plummer, Caldwell, and Good.

Empoasca comara n. sp.

In general form and appearance resembling *fabae* but with bright red coloration on the face, apex of crown and with distinct genitalia. Length 4 mm.

Elongate and rather slender, crown produced, blunt, almost rounded at apex, the width at base not quite one and one-half times the median length.

Color pale almost white, with reddish markings. The face and portions of the head beneath the eyes are bright red. This coloration extends up over the vertex except for pale spots surrounding the ocelli. Crown mostly pale from anterior margins of eyes to base. Pronotum pale, the disc orange red, with a paler longitudinal line through middle of disc. Scutellum white, basal angles more yellowish. Elytra white, subhyaline.

Genitalia: Male styles elongate, narrowed toward apex. The lateral processes are shortened, not as long as aedeagus, thickened to near apex then rather abruptly pointed. The dorsal pygofer spine is broad, extending ventrally and with an anteriorly produced spine-like apex on the ventro-anterio margin which is curved downward and pointed at apex.

Holotype male collected at Chilpancingo Gro., Mexico, October 25, 1941 by E. E. Good and D. M. DeLong.

Empoasca anicar n. sp.

A yellowish species, resembling *fabae* in general appearance but with distinct male genitalia. Length 3.5 mm.

Crown blunt, produced, almost twice as wide between eyes at base as median length.

Color golden yellow, crown with a white spot around each ocellus and a median elongate white spot at middle. Pronotum with three rather large white spots on the anterior margin, one at middle and one behind each eye. Pronotum pale on median apical portion. Elytra golden yellow. Face yellowish.

Genitalia: Male styles long and narrowed on apical portion. Lateral processes long, slender and with apices slightly tapered and pointed. The pygofer spine is almost semicircular in its curvature extending caudally then curving anteriorly on the ventral portion. The basal portion is thickened, then it is narrowed on the apical third and pointed at the apex. The aedeagus is bent at its middle to form a long thickened spine-like portion which extends caudally then curves dorsally and tapers to a pointed apex. An anterior process is narrow and extends dorsally.

Holotype male collected at Taxco Gro., Mexico, October 26, 1941 (K-150) by E. E. Good and D. M. DeLong.

Empoasca anoteya n. sp.

A pale yellowish species with transverse color bands on the elytra and mottling resembling a species of *Erythroneura*. Similar in form to *anicar,* with distinct genitalia. Length 3–3.5 mm.

Crown blunt at apex, slightly produced, about one and one-half times as wide between eyes at base as median length.

Color pale yellow marked with white and dark brown. Face yellow with dark brown at sides beneath the eyes and extending down to the clypeus. Crown and pronotum white mottled with pale yellow. Scutellum with basal angles yellow and apical fourth dark brown. The elytra are white with an irregular dark brown band across base including the apex of scutellum and a broad, dark brown band on each side on costal margin at apex of clavus extending almost half way to the commissural suture. Three spots, two on clavus each side and one between these and just outside the claval vein, yellow. These resemble the pale markings of an *Erythroneura* wing of the *maculata* group.

Genitalia: Female seventh sternite with the posterior margin broadly roundedly produced. The male styles are decidedly longer than the pygofer and tapered on the apical portion. The lateral

processes are rather long and narrow, tapered to sharp pointed apices. The dorsal pygofer spine is thickened on the basal two-thirds then curved anteriorly and ventrally with the apical one-fourth narrowed, pointed at apex and extending anteriorly. The aedeagus is slightly thickened at about two-thirds its length forming an anterior slender dorsally directed process. The caudal portion is the aedeagus proper and is narrowed and blunt at apex.

Holotype male, allotype female and female paratypes collected at Uruapan Mich., Mexico, October 1, 1941 by DeLong, Plummer, Caldwell, and Good.

INTERNATIONAL UNION FOR THE STUDY OF SOCIAL INSECTS.

The number of scientists interested in the investigation of problems concerning the social insects, and the variety of interests among these individuals, have increased sufficiently to create a demand for an international organization to coordinate their efforts and facilitate the study of such problems.

After a preliminary meeting at the 1951 International Congress of Entomology in Amsterdam, the organization of national branches proceeded in France, Germany, Italy, the United States, and other countries. The International Union through which these branches are now associated has its office in Paris, 105 Boulevard Raspail, at the laboratory of Dr. Pierre-P. Grassé, who is President of the international organization.

The principal objective of the International Union is to encourage the scientific study of problems concerning the social insects including all phases of their biology, ecology, taxonomy, and behavior, and to facilitate the exchange of evidence and ideas in this general field through conferences and appropriate publications. The organization will thus foster communication within a large and heterogeneous international body of scientists interested in the social insects and related forms. Previously, articles published on subjects cognate to the social insects have been scattered through a considerable number of highly diversified journals, and integration has been correspondingly limited among the interested investigators and students themselves.

An introductory *BULLETIN* of three numbers was published in France during 1953 and issued to members through the Paris office. Beginning in 1954 an illustrated journal of 320 pages entitled "Insectes Sociaux" will be published by Masson and issued in an annual

volume of quarterly numbers. Subscriptions to this journal may be arranged through Stechert-Hafner, 31 East 10 Street, New York.

Two international symposia on the social insects have been sponsored by this organization and a third one is to be held in conjunction with the next International Congress of Entomology. The North American branch sponsored symposia at the meetings of the Entomological Society of America in Philadelphia in 1952 and in Los Angeles in 1953, and further ones will be held. Comparable conferences are organized periodically by the other national branches.

Those who are seriously interested in the scientific study of problems pertaining to the social insects may apply to the Secretary of the North American branch, Dr. Robert E. Gregg, Department of Zoology, University of Colorado, Boulder, Colorado, for membership application blanks. Members of the organization, in consideration of a modest annual dues payment, receive the "Notes and News" section of the journal.

The North American branch invites the interest of prospective members in Canada, Central America, Mexico and the United States.—T. C. Schneirla, Chairman, North American branch, I. U. S. S. I.

Sira Invades Homes: During 1948 and 1949, *Sira platani* Nicolet climbed up eight concrete steps, to invade my home at Logan, Utah. This fall my attention was called to a moderately heavy invasion of this Collembola species in second story apartments in a building at Ogden, Utah. Dozens of these springtails had become trapped in the bathtub of one apartment. In this instance the bottom one-half of the tub had been set down into the floor. The specimens collected were identified as *S. platani* by Dr. D. L. Wray. Similar infestations of this tiny insect were reported from adjacent apartments. Several years ago, my attention was called to a similar infestation of Collembola in a kitchen sink in a salt Lake City home. It appears likely that this species invades homes more frequently than has been generally recognized.—G. F. Knowlton, Logan, Utah.

HELEIDAE (DIPTERA) ATTACKING BLISTER BEETLES IN MASSACHUSETTS AND ARIZONA.

By Thomas H. Farr, Kingston, Jamaica.

At various times during the first week of July, 1952, small swarms of flies were observed hovering over blister beetles feeding in vetch at Amherst, Massachusetts. The beetles, identified by C. A. Frost as (*Macrobasis*) *Epicauta fabricii* Lec., were obviously annoyed by the midges and crawled erratically about the foliage attempting to evade them. The flies appeared to be biting the beetles in the membranous region at the base of the antenna but those which landed on the legs or elytra were brushed off quickly.

Dr. W. W. Wirth, who examined specimens of the flies sent to him, stated in correspondence that they represent what is probably a new species of *Atrichopogon* (Heleidae). According to him, specimens of this same species were collected in Virginia associated with the meloid, *Macrobasis unicolor* (Kirby).

On June 25, 1953, Dr. Wirth was able to observe another instance of this heleid-meloid relationship at Rustler Park, Chiricahua Mountains, Arizona. The beetles were identified as *Epicauta cinctipennis* Chevrolet by George Vogt. The midges attacking them proved to be *Atrichopogon* also—most likely a new species and distinct from the heleids mentioned above. All specimens collected were females. Wirth noted that a fly would alight on the plant beside a beetle and then reach over with the proboscis to pierce the coleopteron at the base of the leg. Those which attempted to alight on the beetles were repelled as the beetles scrambled away over the foliage.

Similar reports regarding this association have been reported by other workers, among them Kieffer (1922), Edwards (1923), and Blair (1937, 1938).

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This page is limited to exchange notices and to small For Sale advertisements from members of the Society and from actual paid subscribers to the Bulletin exclusively. *Exchange notices* from members of the Society and from subscribers are limited to *three (3) lines each,* including address; beyond 3 lines, there will be a charge of $1.00 for each 3 lines or less additional. *For Sale* ads will be charged at $1.25 for each 3 lines or part of 3 lines. *Commercial or business* advertisements will not be carried in this page, but will go in our regular advertising pages at our regular advertising rates to *everybody.*

LEPIDOPTERA AND ORTHOPTERA from Florida in papers and local specimens mounted to exchange for other Lepidoptera. —Alex K. Wyatt, 5842 N. Kirby Avenue, Chicago (30), Ill.

CERAMBYCIDAE AND CHRYSOMELIDAE from Asia and Pacific desired for determination; purchase; exchange.—J. Linsley Gressitt, Pacific Science Board, Bishop Museum, Honolulu, T.H.

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CONTENTS

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Vol. XLIX OCTOBER, 1954 No. 4

NOTES ON THE GENUS LABOPS, BURMEISTER IN NORTH AMERICA, WITH THE DESCRIPTIONS OF THREE NEW SPECIES (HEMIPTERA: MIRIDAE).

By James A. Slater,[1] Storrs, Conn.

(Continued from the June issue)

Labops utahensis n. sp.

General coloration bluish-black, marked with ivory white to yellowish as follows: irregular spot mesad of eyes that narrows and curves mesad near base of head, but does not reach midline, lateral margins of hemelytra, scattered areas on coxae, extreme apices of femora, jugae and genae; hind tibiae almost black, sometimes possessing a fuscous cast; clothed above and below with intermixed upright hairs and decumbent, sericeous scale-like pubescence, hairs on hind tibiae not obscuring the true spines.

Eyes strongly stalked and tilted slightly upward to apex, jugae nearly flat, not markedly tumid in either sex, width across eyes 1.45 mm. (1.35–1.49), interocular space .88 mm. (.85–.92); pronotum rugose on posterior lobe, calli strongly convex, length pronotum .71 mm. (.64–.78), width pronotum 1.24 mm. (1.21–1.35), length scutellum .64 mm. (.57–.71); hemelytra moderately expanded, strongly tapering caudad, posterior margin bluntly rounded, length 2.87 mm. (2.70–2.98); labium extending caudad to, or nearly to, apex of hind coxae; length antennal segments I, .81 mm. (.71–.99); II, 2.06 mm. (1.78–2.27); III, 1.35 mm. (1.28–1.42); IV, .96 mm. (.92–.99). Total length 4.97 mm. (4.76–5.18).

Brachyptery: Present in all females examined; clavus and cuneus

[1] Department of Zoology and Entomology, University of Connecticut.

well differentiated, apex of hemelytron bluntly rounded, vestige of membrane usually visible.

Genitalia: Males with left gonostylus very elongate and slender the terminal shaft straight for the greater portion of the length, the sensory lobe strongly produced (Plate III, Fig. 1). Females with inter-ramal bridge connected mesally, simple, and consisting of a simple mesally narrowed bar (Plate III, Fig. 18). Posterior wall lacking a mesally directed spine near caudal angle (Plate III, Fig. 13).

Holotype: Female, Utah: Laketown, July 18, 1945. (G. F. Knowlton.) In H. H. Knight collection.

Paratypes: 14 females, 1 male, some data as holotype: 1 male, *Colorado* No. 4389. Specimens in United States National Museum, Canadian National Museum, British Museum, H. H. Knight, University of Connecticut and author's collections.

This is a large, elongate species, averaging somewhat larger than any other North American species. The male and female genitalia as noted above are distinctive. *Utahensis* belongs to the group containing *brooksi* and *hesperius,* by reason of the black hind tibiae, simple nature of the inter-ramal bridge and general habitus. However, the male gonostyli are very different and the posterior wall of the bursa copulatrix is somewhat more suggestive of *burmeisteri* and *hirtus.*

Labops chelifer n. sp.

General coloration black, prominently marked with yellowish-white as follows: stripe along inner margin of eyes and extending mesad along base of head nearly to meson, jugae and genae, apical one-third of scutellum, outer one-half of clavus, corium and cuneus with exception of an extensive darkened area covering central portion of disc, area adjacent to coxae, legs with exception of tarsi and apices of tibiae.

Head strongly declivent, jugae moderately swollen, labium reaching apices of hind coxae, width across eyes 1.32 mm., interocular space .89 mm.; pronotum with posterior lobe rugulose, calli prominent, clothed with mixture of upright hairs and sericeous decumbent scale-like hairs, length pronotum .53 mm., width pronotum 1.12 mm., length scutellum .56 mm.; brachypterous, cuneus differentiated, vestige of membrane present, clothed with upright hairs, but decumbent, scale-like hairs absent, length hemelytron 2.18 mm.; length antennal segments I, .43 mm.; II, 1.25 mm.; III, .66 mm.; IV, .73 mm.; total length 3.14 mm.

Genitalia: Inter-ramal bridge of female appearing as a pair of pincer-like sclerites widely separated from one another (Plate III, Fig. 20).

Holotype: Female, Canada: Reindeer Depot, Mackenzie Delta, July 16, 1948. (J. R. Vockeroth.) In Canadian National Museum collection.

This interesting new species appears to be most closely related to *tumidifrons,* but the female genital structures are very different than those found in any other member of the genus. Externally *chelifer* may be distinguished by the coloration of the corium, the light apex of the scutellum and of the tibiae and femora and the lack of decumbent scale-like hairs on the corium.

Labops verae Knight

This is one of the most distinctive and easily recognized members of the genus by reason of the ridged base of the head, the lack of upright slender hairs on the hemelytra and above all by the extreme degree of brachyptery as discussed above. Both the female and male genitalia are distinctive (Plate III, Figs. 6, 14, 19, 26).

L. verae is somewhat suggestive of the genus *Scirtetellus* Reuter. The distribution appears to be limited to extreme northwestern United States and western Canada.

Specimens examined: 3 males, 1 female: Washington: Mt. Rainier. British Columbia: Hope Mts. 6,500 ft. N.W. Territory: Cameron Bay, Great Bear Lake. In Canadian National Museum and H. H. Knight collections.

Labops tumidifrons Knight

This small species superficially resembles small specimens of *hesperius* and *brooksi* rather closely. The lateral margins of the corium and cuneus are light, the remainder of the dorsal surface black; hind tibiae dark, but suffused with deep reddish-brown at least in the central portion. The inter-ramal bridge with its four posteriorly projecting spines (Plate III, Fig. 15) is quite distinctive as is the peculiarly developed spinous posterior wall (Plate III, Fig. 11).

The distribution while poorly known is northwestern United States and western Canada.

Specimens examined: 23 males, 2 females: Alberta: Manyberries, Irvine, Silkwater. South Dakota: 15 mi. So. Mission, Todd Co. Specimens in Canadian National Museum and author's collection.

Labops hirtus Knight

This species is quite distinct from other members of the genus in North America. The long hairs on the hind tibiae which obscure the true spines, light coloration of hind tibiae and numerous very long slender upright hairs on the hemelytra together with good specific characters in both male and female genitalia (Plate III, Figs. 7, 16, 22) make this a readily recognizable species. The subapical projection on the right gonostylus is readily recognizable even in undissected specimens.

There is considerable size variation in specimens of *hirtus* from different localities. I have examined a series in the Knight collection from Mt. Adams, Washington that are all extremely small and very densely setose. However the male and female genitalia of these specimens are typically *hirtus*. *Hirtus* appears to be rather closely related to *setosus* Reuter described from Siberia insofar as one may judge by the description of the latter species.

This appears to be the only species of *Labops* that ranges across the northeastern United States, however it occurs together with *hesperius* and other species in the Western United States and Canada.

Specimens examined: 77 males, 43 females: Washington: Mt. Adams. Michigan: Mackinaw Co. Ontario: Fisher Glen; Bell's Corner; Delhi; Algonquin Park; Norway Point, Lake of Bays; Strathroy; Ottawa. Quebec: Knowlton, Queen's Park, Aylmer; Meach Lake; Covey Hill; Kazubazua; Fairy Lake; Abitibi Region. British Columbia: Clinton, Rolla, Cranbrook. Alberta: Cardston; Edmonton. Nebraska: Valentine. New Hampshire: Mt. Washington 6000 ft.; White Mts., Hermit Lake. Colorado: Gothic 9500 ft.; Glacier Basin, Rocky Mt. Nat. Park. Specimens in Canadian National Museum, H. H. Knight, University of Connecticut, University of Massachusetts and author's collection.

Labops burmeisteri Stal

This species may readily be separated from other Nearctic *Labops* by the lack of light coloration along the lateral margin of the corium, giving the entire dorsal surface a uniformly black coloration with the exception of the basal portion of the head. One specimen from Dawson, Yukon has the posterior lobe of the pronotum white. The antennae, femora and tarsi are black, tibiae dull reddish-brown to yellowish on distal two-thirds with exception of extreme apex; corium and pronotum densely clothed with upright hairs, decumbent scale-like hairs present on pronotum and

along clavus, but usually sparsely represented on corium, particularly in the males.

Male gonostyli distinctive, the right gonostylus curved at nearly a right angle apically (Plate III, Fig. 21), more strongly so than in any other member of the genus. Left gonostylus with sensory lobe produced somewhat trough-like (Plate III, Fig. 5). Female genitalia with inter-ramal bridge bearing two posteriorly directed spines that arise mesad of the lateral end of the main shaft which is contiguous mesally (Plate III, Fig. 17).

Burmeisteri is probably most closely related to *hirtus*. The dense upright pubescence and reduced amount of scale-like hairs on the hemelytra, the composition of the inter-ramal bridge and of the posterior wall of the bursa (Plate III, Fig. 9) are all suggestive of the latter species.

This is a Holarctic species that appears to be essentially Hudsonian in distribution in North America.

Specimens examined: 24 males, 14 females: Canada: Dawson; Yukon; Reindeer Depot; MacKenzie Delta; Mt. Lyall, Quebec, 1500 ft.; Abitibi Region. (W. W. Judd, W. J. Brown, Cook.) Alaska: Steese Highway; Kantishna; Mt. McKinley Park. In Canadian National Museum and University of Massachusetts collections.

Labops hesperius Uhler

This is the only North American species of the genus in which the male jugae are enormously inflated. *Hesperius* is very closely related to *brooksi* and the two are obviously derived from a common stock. Indeed between these two species occurs the only place where the usually good specific characters found in the female inter-ramal bridge and posterior wall of the bursa are of no value.

The distribution is typically western, ranging eastward into South Dakota and Nebraska and in the north possibly into Ontario and Quebec. The older literature records are somewhat unreliable and eastern records should probably be referred to *hirtus*.

I have examined the two male specimens noted by Knight (1922) as having an abnormal development of the right gonostylus and agree that otherwise they are typical *hesperius*, furthermore a third male and three females taken at the same locality and time possess all of the diagnostic features of the species.

Mills (1939 and 1941) refers to this species as the "Grass Plant Bug" a common name which has not yet found its way into the "approved" list of common names.

Specimens examined: 47 males, 86 females: Alberta: Maligne Lake; Nordegg; Banff. British Columbia: "Paul L. Komloops." Montana: Big Horn Co. Wyoming: Shoshone National Forest. Oregon: Aneroid Lake 7500 ft. Colorado: Mesa; Gothic; Rabbit Ear Pass. Nebraska: Valentine; S.W. Corner, Brown Co. S. Dakota: 15 mi. So. Mission, Todd Co. Yukon: Dawson. Specimens in Canadian National Museum, H. H. Knight, University of Connecticut, University of Massachusetts and author's collection.

The author wishes to express his deep appreciation to Mr. A. R. Brooks of the Canadian Dept. of Agriculture, Saskatoon, Saskatchewan for calling attention to the presence of a new species from his area, making the illustrations of the heads of *hesperius* and *brooksi* and the dorsal view of *hirtus* and for the loan of material; and to Dr. Newell Smith of the Canadian National Museum, Dr. H. H. Knight of Iowa State College and Dr. Marion Smith of the University of Massachusetts for the loan of material. Appreciation for the collection of material is extended to the Northern Insect Survey, a joint project of the Canadian Division of Entomology and the Defence Research Board.

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BREEDING PLACES OF AEDES PSEUDODIANTAEUS SMITH AND DIANTAEUS H., D., & K. IN ALASKA.

By W. C. Frohne[1] and R. G. Frohne, Anchorage, Alaska.

With an admirably complete description of a new mosquito, *Aedes pseudodiantaeus,* Dr. Marion Smith (1952) redescribed *A. diantaeus* with which the new species had been confused. She noted the occurrence of both species in Alaska, the new one on the basis of a single larva. In a later personal communication Dr. Smith suggested that *pseudodiantaeus,* like *diantaeus,* probably belongs among the common Alaskan mosquitoes. The type habitat in Massachusetts and the breeding places in northern Michigan, where Irwin (1942, 1943) found *pseudodiantaeus* during a study of mosquito production of bog mats, are *quaking* bogs. The purpose of the present paper is to report the occurrence of *pseudodiantaeus* in certain Alaskan *quaking* bogs and to characterize this habitat of predilection. Differences in the larval ecologies of *pseudodiantaeus* and *diantaeus* are noted.

Aedes diantaeus H., D., and K.

Diantaeus is a holarctic mosquito, rare and local in northern Europe, Siberia, and North America. In Alaska the species is evidently commonplace between 60 and 66 degrees North latitude over a vast subarctic area which includes Anchorage, Fairbanks, and the Interior highway system. Jenkins (1948) reported *diantaeus to be* "fairly common" there after reconnaissance of 1947 of the Alaska Insect Project. Subsequent local surveys of the AIP and the Arctic Health Research Center confirmed his findings. Based on frequency and abundance *diantaeus* has been placed ninth, or in the middle of the list of 16 or 17 mosquitoes of Anchorage and Fairbanks, respectively. There is, of course, local variation in abundance. In our survey of 1953 in the Copper River region, 200–250 miles from either Anchorage or Fairbanks, we found *diantaeus* slightly less common; 13 (12%) of 112 larval collections contained *diantaeus* wigglers. However, these larvae were collected more often than *Aedes impiger, cinereus, pseudodiantaeus, Culiseta impatiens, Anopheles* sp., and several uncommon or rare species. They were, on the other hand, less frequent and generally much less abundant than *Aedes communis, punctor* (complex),

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pionips, fitchii, excrucians, cataphylla, Culiseta alaskaensis, morsitans, and *Culex territans.*

In Alaska *diantaeus* is not an early species, although it has been so regarded in Saskatchewan by Rempel (1953). In the Copper River region the eggs hatched before the middle of May and large wigglers were most commonly encountered the last week of that month. Thus of 44 collections dipped May 7–10, only one included *diantaeus* wigglers, but when these marked pools, except a few which had dried up, were redipped May 21–24 there were 8 *diantaeus* collections among the 39 wiggler collections. The pool habitats and the *diantaeus* larvae were quite transitory, as the third dipping made June 2–4 indicates. By that time only about half of the original pools contained any water, and *diantaeus* occurred in only 4 of the total of 29 wiggler collections. It was notable, however, that the *diantaeus* larvae, which were among the latest wigglers to hatch in these mostly evanescent vernal pools, frequently pupated and emerged at the very nick of time before they dried up. *Diantaeus* developed just as fast, apparently, and pupated over the same period in the semi-permanent bog pools and one permanent quaking bog as in the vernal pools.

The larval habitats of *diantaeus* outside Alaska are varied. Smith (1952) considers bog fringes and stagnant ditches in woods typical. For Alaska Jenkins reported open sphagnum-heath bogs, temporary vernal pools, depressions containing *Carex,* grass, or *Equisetum,* and the margins of permanent pools. Our field notes on the Copper River collections similarly characterize the breeding places as: *Carex* inclusions of a large bog; moss-*Potentilla palustris* pools; barren potholes in dense black spruce forest; open vernal *Branchipus* pools; deep roadside ditches bordered by scrubby willows; and shallow, mossy ditches either open or partly shaded. It would be premature to attempt definition of the habitat or selection of preferred habitats. Negatively, brackish waters and the open waters of lakes may be excluded. Otherwise the Alaskan surveys indicate no more than indiscriminate breeding in natural depressions so varied as to include the temporary or permanent, barren or rankly occupied by higher plants, exposed to the sun or densely shaded; clear or turbid; colorless or tea-colored, acid or alkaline.

A helpful adjunct to the descriptions of the breeding areas of a mosquito is the list of associated wigglers. The associations actually express complicated ecological conditions in a form understandable especially to mosquito workers. Unfortunately, however, many northern mosquitoes show remarkably wide tolerances

to different habitats. *Diantaeus* is such a species. The fact that two species, e.g. *diantaeus* and *communis,* are often associated in Alaska is not enough to prove similar habitat preferences although this association indicates a high degree of tolerance of the larvae and a non-selectiveness by the ovipositing females of one or both species. The different degrees of association of the various Alaskan wigglers with *diantaeus* result from overlapping seasonal occurrences, relative frequencies, and even unintentional selective sampling. Thus for the case at hand, *diantaeus* with *communis,* the stragglers of the abundant, early *communis* are almost ubiquitous in the study area, and also being sluggish late in May, frequently from peritrich *Aufwuchs,* are easily caught. It is suggested to mosquito workers searching for *diantaeus,* however, that the association of *diantaeus* with *excrucians* and with *fitchii* may be due primarily to similar habitat preferences and that therefore the pools and ditches of *fitchii* and the weedy ponds of *excrucians* should be thoroughly dipped.

Representative associations of *diantaeus* with other Alaskan wigglers are provided by Jenkins and the Copper River survey of 1953: Jenkins found *diantaeus* associated with *punctor* 12 times, *excrucians* 8 times, *communis* 6 times, and with *fitchii, pionips,* and *Culiseta morsitans* 4 times each. For the 14 collections containing *diantaeus* in the copper River survey *communis* occurred in 10, *pionips* in 9, *fitchii* in 6, *punctor* (complex) in 5, *excrucians* in 4, *cataphylla* in 1, and *Culiseta morsitans* in 2.

Wesenberg-Lund in Denmark, who first described the larva of *diantaeus,* was impressed with the red-brown color of his wigglers. Later authors do not mention larval color. Eight random collections mostly including large larvae were rechecked on this point after we noticed that in certain pools all the *diantaeus* wigglers were red-brown and could be conveniently separated alive with the naked eye. However, although in 4 of the 8 collections all the *diantaeus* larvae were red-brown, they were olive-grey or dull-brown in three, and pale tan with a yellowish cast in one.

Aedes pseudodiantaeus Smith

Pseudodiantaeus is restricted to the nearctic region so far as known. Smith (1952) gives the relatively few distribution records in the U. S., Canada, and Alaska. In the present study the species was collected from two quaking bogs beside the Edgerton Cutoff (road) in the Copper River valley. One bog is located one-half mile north of Chitina on the east side of the highway at elevation

about 590 feet. The other one is approximately a mile northwest of Liberty Falls on the southwest side of the road at about 1,000 feet elevation.

The Chitina quaking bog, polluted by a refuse dump, was characterized by low wiggler densities. On May 10 it was mostly still frozen and no dipping was done until May 21: scattered *communis* and *punctor,* 3d, 4th stages; 3 *pseudodiantaeus,* 2d stage. On June 3: 1 *punctor,* 1 *excrucians,* 4th; 14 *Culiseta morsitans,* 2d, 3d: 17 *pseudodiantaeus,* 2d–4th, mostly 3d. June 29: no *Aedes* larvae taken; 3 *Culiseta morsitans,* 3d, 4th; numerous *Culex territans,* 1st–3d; several *Anopheles* sp., 1st, 2d stages.

The Liberty Falls quaking bog, which is completely natural, was characterized by high wiggler densities, especially of *pseudodiantaeus,* the dominant species. Dr. Smith mentions taking 15 or 20 *pseudodiantaeus* to the dip in the Belchertown, Mass., bog; similar densities obtained during the first half of June in this Alaskan bog. These teeming wigglers inhabit a zone which dries up in July shoreward of the moss. First dipped May 9: *punctor* complex, *communis,* many 2d. On May 21: *communis, punctor* complex, many 4th; *pseudodiantaeus,* 2d, abundant. On June 2 a representative collection of 143 wigglers gave: 58% *pseudodiantaeus* 2d, 3d mostly, 4th; 21% *communis,* 3d, 4th mostly; 9% *Culiseta morsitans* 2d, 3d; 1% *excrucians,* 2d, 3d. *Odonata* nymphs, *Mochlonyx* sp., *Paradixa* sp., water beetles, and tadpoles of the arctic frog were also numerous. On June 16 a comparable dipping of 216 larvae there gave: 51% *pseudodiantaeus,* 3d, 4th; no *communis, diantaeus,* or *excrucians;* and 30% *Culiseta morsitans. Culex territans* 1st and 2nd stages had appeared and 2 small *Anopheles* sp. were noted.

It will be useful to distinguish the quaking bogs favored by *pseudodiantaeus* from more numerous and vastly more extensive wet areas loosely called bogs in Alaska. Bogs result from poor drainage and incomplete decomposition so that in cool, glaciated, northern regions like Alaska they may be commonplace. To plant ecologists "a bog is characterized by conifers (black spruce), ericads, peat-forming mosses, commonly sphagnum, and by a cushion-like substratum of raw peat." (Moss, 1953.) The same author has been especially helpful to us because he has distinguished two series of bogs in Alberta which are easily recognizable in Alaska: (1) *Drepanocladus-Carex* bogs; (2) *Sphagnum-Ledum-Picea* bogs. The succession is from (1) to (2). "Where the larger masses of water are retarded or partially imprisoned in the more or less well-defined

drainage basis (of a network of sluggish drainage canals) 'quaking' muskegs result." (Wyatt and Leahy cited in Moss, l. c.). Both the Chitina and the Liberty Falls bogs are examples of (1) although two different species of *Drepanocladus* bog moss are involved. We are indebted to Dr. Elva Lawton for identification of *D. aduncus Kneiffi* Warnst. from the Chitina bog and *D. exannulatus* (Gümb.) Warnst. from the Liberty Falls bog.

The higher plants growing in the *Drepanocladus-Carex* quaking bogs in Alaska where *pseudodiantaeus* was collected are an assemblage much less characteristic than those of *Sphagnum-Ledum-Picea* bogs. The similar appearance of the Chitina and Liberty Falls bogs is due primarily to the *Drepanocladus* moss mat and to *Carex,* but the abundant occurrence of buckbean (*Menyanthes trifoliata*) and marsh cinquefoil (*Potentilla palustris*), chiefly as indistinct zones, contributes to the similarity. The other higher plants found there, like most of the wigglers of these bogs, are common, tolerant, northern species of wet places.

Preliminary examination of the bog waters themselves show the pH of both bogs fluctuates from 6.5 to 7.3 and that their microbiotas are peculiarly similar. Two identical *Cosmarium,* one species each of *Closterium* and *Euastrum* were the common desmids of both. Meanwhile as additional *pseudodiantaeus* breeding areas are sought the *Drepanocladus-Carex* quaking bogs are easily recognized by the *Drepanocladus-Carex* mats alone.

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APHIDS IN STOMACHS OF SMALL VERTEBRATES.

By George F. Knowlton, Logan, Utah.

Recently Professor M. A. Palmer looked over a series of my aphid slides. Among these were several slides containing mounted aphid specimens taken from stomachs of small birds and lizards. Recognizable aphid specimens were as follows:

Cinara atra (G.-P.) from stomach of a long-tailed chickadee. This bird was taken east of Fruitland, Utah, July 18, 1941, in a juniper-pinion area. Numerous specimens of this same aphid species also were found in the stomach of a pine ciskin, collected nearby on the same date and area.

Alphis helichrysi Kalt. Specimens were present in the stomach of a chipping sparrow, collected in Arron Canyon, Cache County, Utah, August 28, 1941.

A. medicaginis Koch. Two wingless specimens were present in a sagebrush swift stomach, *Sceloporus graciosus graciosus* (B.-G.) collected in Government Creek Canyon, Tooele County, Utah, June 3, 1953.

Artemisaphis artemisicola (Williams). In sagebrush swift stomach, *Sceloporus g. graciosus* at Government Creek Canyon, Utah, June 5, 1952.

Macrosiphum pisi (Kalt.). A number of pea aphids were present in stomachs of vesper sparrows taken at Hyde Park, Utah, July 17, 1941. Pea aphids also were present in the stomach of a small sagebrush swift lizard, *Sceloporus g. graciosus,* collected in an *Artemisia-Chrysothamus* area in Cedar Valley, Utah, May 29, 1941 by H. F. Thornley and the writer; and in a small *Uta stansburiana stansburiana* (B.-G.) lizard's stomach, the specimen having been taken on the margin of an alfalfa field next to range land at Elgin, Utah, May 8, 1941.

Macrosiphum artemisiphilum K.-A. A specimen of this sage infesting aphid also was present in the sagebrush swift lizard stomach, *Sceloporus g. graciosus,* taken in Cedar Valley on January 29, 1941. Several additional aphid specimens were taken from stomachs of these swifts, collected in the Government Creek area of Tooele County, June 3, 1953.

Pseudoepameibaphis tridentatae (Wilson). This species made up part of the aphid material found in a rock wren stomach, from a specimen collected at Dolomite, Tooele County, Utah, September 28, 1941, by W. D. Fronk and the writer. A few mites also were present in this stomach.

Epameibaphis sp. in sagebrush swift stomach, collected in sage area of Government Creek Canyon, Tooele County, Utah, June 3, 1953.

Pemphigus balsamiferae Williams. A winged specimen, well cleared from digestion (as often is the case), was in the stomach of a brown shouldered uta lizard, *Uta s. stansburiana,* collected in a sage-juniper area near Oak City, Millard County, Utah, September 28, 1941.

A lizard in my clothing: "Ants in the pants" is a common way of referring to a restless person. Frequently it is an actual occurrence. I can attest to the latter, after experimenting with ant control during various summers since 1923. My most unpleasant experiences with ant stings and bites on the legs were received from western harvester ants (largely *Pogonomyrmex occidentalis* Cresson) during 1951 through 1953. These occurred largely while I was experimenting with 25% heptachlor powder. This greatly annoys them when applied over nest entrances for control.

My most interesting experience with "ants in my personal apparel" occurred near Moab, Utah, on April 24, 1953. A stop was made along the highway north of the Colorado River, about one-half mile west of the river bridge. I had just "swept" short Russian thistle plant growth with an insect net, capturing 1 to 2 beet leafhoppers, *Circulifer tenellus* (Baker), in each series of 15 sweeps. A lizard, *Uta stansburiana stansburiana* (Baird and Girard) which was only one-half grown, ran across the lightly vegetated area near me. I tried to capture it with my inseect net handle. However it ran to my feet, up my shoe and into my left trousers leg. Knowing I had this gentle little pet roaming about inside my clothing caused me to feel restless. Several times I thought I felt the small lizard creeping about in various areas of my clothes. Approximately twenty minutes after it had invaded my apparel, and while I was riding with County Agricultural Agent Paul R. Grimshaw in his car, I felt something on the middle of my back, just below my shoulder blades. Mr. Grimshaw investigated, and together we captured the lizard. On careful stomach examination, one ant, 2 beet leafhoppers, 1 small caterpillar, 1 termite and 1 springtail (Collembola) were found to have been recently eaten, plus two tender leaves of Russian thistle.

A second lizard of this species was collected while the above mentioned specimen still "haunted" my clothing. It was a mature female. Its stomach held one false chinch bug nymph, *Nysius ericae* Schill., three ants, one small weevil, a small fly, and insect fragments.—George F. Knowlton, Utah State Agricultural College, Logan, Utah.

PYROTA PLAGIATA (HAAG) A VALID MEXICAN SPECIES (COLEOP., MELOIDAE).

By Floyd G. Werner, Burlington, Vermont.

Both Champion and Vaurie have considered certain Mexican specimens of *Pyrota* to be identifiable with *P. postica* LeConte. A re-examination of Mrs. Vaurie's long series from Chihuahua leads me to the conclusion that this series, and Champion's, cannot be included in *postica* but should be referred to *P. plagiata* (Haag).

A series of typical *postica* from Laredo, Texas shows very little variation in color pattern. The black fascia behind the middle of the elytra is subquadrate and never much longer than broad. In no case is it more than 0.35 the length of the elytra. In Mrs. Vaurie's Chihuahua series this fascia is usually elongate-oval, as in Champion's figure, in extreme cases connecting with the humeral spot, as in Lacordaire's figure. It ranges from 0.42 to 0.67 as long as the elytra, the higher figures being subject to error because of the fusing with the humeral spot. The general background color is pale yellow in *postica,* a more orange-yellow on at least the head and pronotum of the Chihuahua series.

Correlated with these differences in color and pattern there are constant differences in the maxillary palpi of the male, as shown in figures 1 to 4. The elytra are also quite different in the two. The Laredo series has the elytra almost smooth, with the costae present but not particularly demarcated. In the Chihuahua series the costae are more evident and bounded by slight depressions, and the intervals between the costae are somewhat swollen.

The selection of the proper name to apply to the Chihuahua series is a difficult task. In am following a decision of the 1948 session of the International Commission at Paris, as outlined on p. 226 of Mayr, Linsley and Usinger, 1953, "Methods and Principles of Systematic Zoology." This decision would call for the rejection of the name *Cantharis maculata* Lacordaire, 1859, on the grounds that it was once a secondary junior homonym of *Lytta maculata* Say, 1823, was detected at the time and replaced with a substitute name, *Cantharis Lacordairei* Berg, 1881. (Both had been listed as *Cantharis maculata* in Gemminger and Harold, Catalogus Coleopterorum *7* (1870) : 2151.) Following the decision of the Commission as outlined, *maculata* Lacordaire would be replaced permanently by *Lacordairei* Berg, 1881. Since the name *Lytta plagiata* Haag, 1880, has one-year priority over *Lacordairei* Berg, it

is the one that is the first available name. There can be little doubt that Vaurie's series and Champion's specimens from Villa Lerdo can be referred to it.

The basis for the name *Cantharis maculata* Lacordaire, an undoubted *Pyrota,* is rather unsatisfactory. The name dates from a title for a figure, without locality designation or description. Berg first (1881) states that it applies to a distinct Mexican species and that he has examined the type. Later (1883) he synonymizes it under *divirgata* (Vill. y Peñ.). Burmeister (1881) synonymizes it under *vittigera* Blanch. Champion (1892) disagrees with both these synonymies and relegates it to synonymy under *postica* LeConte. I agree with Champion to the extent of withdrawing it and its substitute, plus *plagiata* (Haag), names he considers synonyms of *postica,* and uniting them as possible names for a species he did not recognize. Because of these vagaries it is perhaps fortunate that *maculata* Lacordaire is not available as the name of this species. By a technicality it becomes a junior synonym of *plagiata* (Haag), because it dates from Berg's substitute name. The synonymy now rests as follows:

Pyrota plagiata (Haag)

Cantharis maculata Lacordaire, 1859, Gen. Col. *5,* Atlas, pl. 60, fig. 4,4a, 4b; non *Cantharis maculata* (Say), 1823 of Gemminger & Harold, 1870, Catalogus Coleopterorum *7:* 2151.

Lytta plagiata Haag, 1880, Berl. Ent. Zeitschr. *1880:* 49.

Cantharis vittigera, Burm., 1881, Stett. Ent. Zeit. *42:* 22, in part.

Cantharis Lacordairei Berg, 1881, Stett. Ent. Zeit. *42:* 303. Substitute name for *maculata* Lacordaire non Say.

Lytta divirgata, Berg, 1883, An. Soc. Cient. Argentina *15:* 68, in part.

Pyrota postica, Dugès, 1889, An. Mus. Michoacano *2:* 94. Champion, 1892, Biol. Cent.-Am., Coleop. *4* (2): 431, pl. 20, fig. 5, at least in part.

Pyrota divirgata, Denier, 1934, Rev. Soc. Ent. Argentina *6:* 60, 64, in part.

Pyrota postica, Vaurie, 1950, American Museum Novitates *1477:* 51, in part.

The Monterey, Nuevo Leon and Ahualulco, Jalisco specimens cited from older authors by Champion and Vaurie have not been available for study. I did not see any specimens answering the description of the Ahualulco specimens in the remnants of the Dugès collection in Mexico City. Nor were the specimens cited

by Horn as from Monterey available. Until Horn's specimens are restudied, the identity of the Monterey reference will be in doubt. Except for this one case, I believe that all of the Mexican specimens thus far recorded in the literature as being *postica* should be refered to *plagiata*. I have, however, examined only the series reported on by Mrs. Vaurie. *Postica* will undoubtedly be shown to occur also in Mexico, at least along the borders of Texas, New Mexico and Arizona.

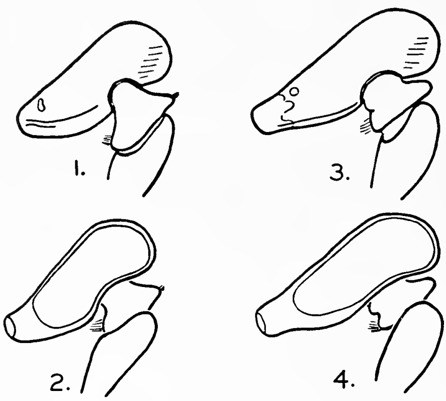


Fig. 1. *Pyrota plagiata* (Haag), dorsal view of right maxillary palpus of male. San Jose Babicora, Chihuahua, Mexico, 7100 ft.; July 5, 1947, D. Rockefeller Exp., M. A. Cazier collector. Fig. 2. Same specimen, ventral view of left maxillary palpus. Fig. 3. *Pyrota postica* LeConte, dorsal view of right maxillary palpus of male. Laredo, Webb Co., Texas; May 20–24, 1948, W. Nutting and F. G. Werner collectors. Fig. 4. Same specimen, ventral view of left maxillary palpus. All figures drawn with the aid of a camera lucida.

NOTES ON THE USE OF PHOTOGRAPHY IN TAXONOMIC WORK.

By J. Linsley Gressitt, Honolulu, Hawaii.

Dos Passos (1946) has described a practical method for photographing insect specimens by the use of the Leica and the sliding focusing copying attachment, or by the fixed-focus method. Another method is the use of a Speed-graphic with photo-flood lamps or flash. A still simpler method, ideal for photographing type specimens or other during travel, because of the minimum of equipment to be carried, is described below.

This method is essentially a simplification of the equipment discussed by Ross (1953) for photographing living insects in action. The only essential equipment is an Exakta camera with bellows extension (Novoflex or Belloscope) and cable release. Two corks, cut to the correct heights, support the back of the camera so a tripod or swivel attachment is not needed. The camera with extended bellows is placed horizontally on a steady table, the corks put in place and a strip of cellotape used to fix the terminal end of the base of the bellows attachment to the table. A light meter is helpful, but can be dispensed with after experience has demonstrated the latitude in exposure permitted by the equipment. A sheet of standard tables for the different types of lenses indicating the exposure factor for the various lengths of extension of the bellows is provided by the Exakta Company and enables one to determine immediately, with the light meter, the exposure to use. For maximum depth of focus, the exposures are always made at f. 22, the smallest opening of the ordinary Tessar f. 3.5 50 mm. lens, which is the most practical one for this purpose. Thus the only variables are the length of time of exposure and the focusing. The latter is accomplished by extending the bellows attachment to the proper degree to obtain the desired enlargement or to keep the insect, if large, within the field. Then the subject is moved forward and backward, with the lens aperture wide open, until perfect focus is attained, sighting through the lens by means of the reflex finder. The insect is pinned onto the vertical portion of piece of cork-sheet pinned to a horizontal piece for support. Lighting may be provided by two desk lamps or preferably by one microscope lamp and one desk lamp, placed on opposite sides of the specimen, the desk lamp on the side towards the window. It is desirable constantly to use the same illumination for uniform results. However, when one is travelling to foreign countries this may not be convenient,

particularly since transformers and various kinds of wall plugs would be necessary to adjust to the various circumstances in different countries. One of the new model portable electronic flash outfits may be the best solution.

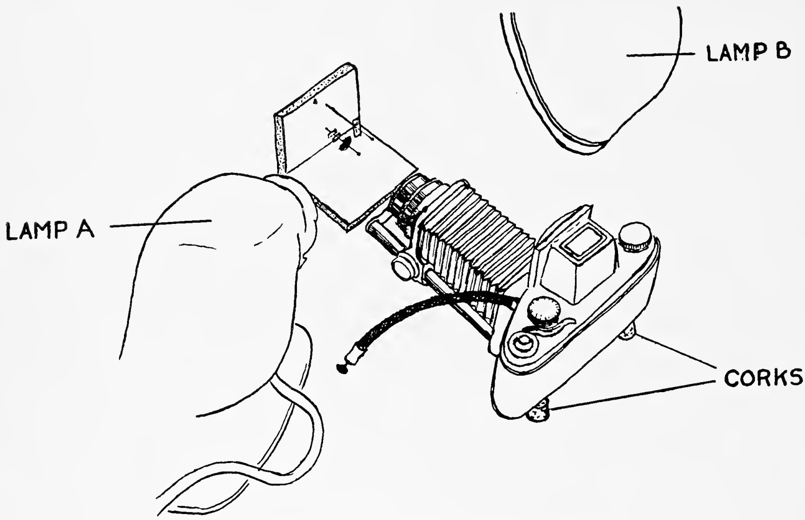


Fig. 1. Sketch of photographic assembly.

Recently I made a two and one-half month trip in Europe, during which time I visited 14 museums and photographed types in most of them. Photographs were taken of about 1600 type specimens at a cost of less than ten cents each. The 35 mm. film of speed 50 was purchased in 100 foot or 25 or 17 meters rolls and cut and rolled in casettes by myself, but the developing and enlarging, to 7×10 cm. size was done commercially. By doing one's own developing and enlarging the unit cost would be much reduced. My equipment consisted only of the Exakta and the $8 \times 8 \times 15$ cm. box containing bellows, cable release, light meter, cork-sheet stand and cork supports, plus the sheet of exposure factor data and paper for recording the names and other data, by number for each roll, of the specimens photographed. In labelling the prints later those of each film roll were arranged in the order on the negative and the data transposed from the record sheet. To avoid chance of errors in assigning data, part of the name-label can be included in the field of the picture, or a small label written and pinned beside the insect, or the position of antennae or legs indicated after the name on the list.

After my return I mounted the enlargements individually on 5×8 inch ruled file cards, trimming the prints and glueing them in succession on left, middle and right side of the cards, so the resulting file would not be bulging on one side. Before attaching the print the name and data were typed on the top line of the card, leaving room above for addition of current or later generic assignment. Thus, a sample is as follows:

Clythra longipes Fabr. T 4 K-7-19 Kiel coll. dr. 9

Of the abbreviations, "T" stands for type, followed by a figure for the number of specimens in the series. The formula K-7-19 indicates the 19th specimen on the seventh film exposed at Kopenhagen. Kiel coll dr. 9 indicates that the specimen is in drawer 9 of the beetle section of the Fabricius collection from Kiel ("Fabricius' own collection"), which is now at Kopenhagen in addition to the Kopenhagen Fabricius collection, which contains a comparable number of types. To indicate the various museums, abbreviations were used as follows: B—British Museum; S—Riksmuseum, Stockholm; K—Universitetets Zoologiska Museum, Kopenhagen; A—Zoological Museum, Amsterdam; L—Rijksmuseum, Leiden; Brux—Institute Royale des Sciences Naturelles, Bruxelles; Senck—Senckenbergisches Natur-Museum, Frankfurt; V—Naturhistorisches Museum, Vienna; P—Muséum d'Histoire Naturelle, Paris. After all prints were mounted, correctly labelled, and the negatives marked B-9, etc., the cards were arranged systematically, and the file serves as a reference of the greatest value, to which may be added notes, or detail sketches, as desired. In the case of species described long ago, at least, this method of reference may be much more useful than the original descriptions.

Some of the pictures were taken with Kodachrome or Agfa color film. In these cases the cardboard mounts are slipped into cellophane envelopes attached to the file cards with cellotape and trimmed in front so the slides may be easily slipped out for viewing. Thus they may be kept in the same file with black and white pictures.

This method is applicable, with satisfying results, to many types of insects, ranging in size from less than 2 mm. to 50 mm. in length, or larger if they are taken in sections or if a short extension tube is substituted for the bellows. Smaller insects may be taken using the bellows plus an extension tube, or by using a microscope with attachment.

Another practical use of this method in taxonomy is to photograph specimens to be illustrated, enlarging to the proper size and

then making a tracing for the actual drawing. This gives the advantages of freedom from the use of "grate" or camera lucida, and the attainment of exact outlines, proportions, pattern and puncture arrangement. In other words, one gains the advantages of a photograph plus those of a drawing, together with the lower cost of reproduction by zinc cut.

Literature Cited

dos Passos, C. F. 1946. The photography of Lepidoptera. Bull. Brooklyn Ent. Soc. 40: 166–169, 4 figs.

Ross, E. S. 1953. Insects close up. 80 pp., 125 figs. University of California Press.

(Since the above was in press I obtained a Lumax electronic flash operating on four flashlight batteries. Though adding three pounds weight to the equipment it provides uniform lighting, permits quick exposures and dispenses with the light meter.)

Paratrioza cockerelli (Sulc.) on celery.—Adult potato psyllids, *P. cockerelli,* were observed in abundance on a field of potatoes at Springville, Utah, on September 23, 1953. This crop had been made worthless by psyllid yellows. On the same date, adult *P. cockerelli* were collected quite commonly on celery in every field examined at Springville, Provo, American Fork, Lehi (Saratoga area) and at Farmington. Adults continued to be present on celery, including fields at Midvale, wherever it was examined through mid-October. This pest was more numerous over much of Utah during 1953 than I had observed it to be for several years.—G. F. Knowlton, Logan, Utah.

NEW HEMIPTERA FROM REDWOOD (MIRIDAE, CICADELLIDAE).

By Brunson P. Bliven,[1] Eureka, Calif.

One day in September, 1947, the writer noticed the feeding punctures of some insect on the green cones of redwood trees growing in his yard at Eureka This city is located on the shores of Humboldt Bay in the redwood belt of northern California. Upon going forth that evening to examine the trees with the aid of a flashlight, large numbers of pink-colored mirids (*Phytocoris sequoiae* n. sp.) were seen to be flying about and crawling over the twigs and cones of the trees. Unlike many other nocturnal mirids, they did not seem to be attracted to the light. Since that time a special effort has been made to collect more specimens and during the course of this work, in Eureka and in the surrounding area, a number of new species of Hemiptera have been discovered on redwood. Sufficient collecting has been done in every case to definitely establish the host plant relationship. Eight of these species are here presented. Others will follow. Types and allotypes of all species are to be deposited in the United States National Museum, Washington, D. C., paratypes to be retained by the author.

Miridae

Dichrooscytus sequoiae n. sp.

Resembles *D. viridicans* Kngt. in its almost unicolorous green aspect but differs in size and relative proportions. Rostrum reaching sixth or seventh ventral segment.

Male. Length 4.48 mm., width 1.72 mm. Head: width, 1.11 mm., vertex .50 mm. Rostrum, length 2.15 mm., reaching or surpassing sixth ventral segment. Antennae: segment I, length .40 mm., II, 1.80 mm., III, .85 mm., IV, .56 mm. Pronotum, length .70 mm., width at base 1.32 mm.

Color: leaf-green in life, partially fading to yellow with the drying of the specimen. Vestiture: upper surface sparsely covered with mixture of many black and a few paler, deciduous hairs, these becoming thickest and longest on head and cuneus. Hemelytra without markings, membrane lightly infuscated, veins yellow.

Female. Similar to male except in size. Length 4.80 mm., width 1.78 mm. Head: width 1.18 mm., vertex .56 mm. Rostrum, length 2.16 mm., reaching base of genital segment. Antennae: segment

[1] City Entomologist.

I, length .42 mm., II, 2 mm., III, .50 mm., IV, .90 mm. Pronotum: length .70 mm., width at base 1.36 mm.

Host plant: redwood, *Sequoia sempervirens* (Lamb.) Endl. Single-brooded, nymphs appear in July.

Holotype (male): Shively, Humboldt Co., Calif., IX.9.51. Allotype (female): same locality, XI.2.52. Paratypes: 10 males, 10 females from type locality, Aug. 24th to Nov. 16th. One female paratype, Grizzly Cr., Humboldt Co., Calif., X.1.50. All collected on the host plant by the author.

Phytocoris yuroki n. sp.

Near *P. onustus* V. D. but readily differentiated by the distinct markings, the complex pubescence and genitalic characters. The yellow areas are pale green in life.

Male. Length 6.40 mm., width 2.24 mm. Head: width .99 mm., vertex .35 mm. Rostrum, length 2.72 mm., reaching sixth ventral segment. Antennae: segment I, length 1.21 mm., II, 2.48 mm., III, 1.26 mm., IV, .96 mm. Pronotum: length .96 mm., width at base 1.82 mm.

Robust, testaceous, heavily mottled with fuscous, imparting a dark brownish black aspect. Dorsum rather thickly beset with unusually coarse, pale to fuscous, simple hairs, these longest on pronotum. Surface clothed with sericeous golden pubescence and white scale-like hairs. Collum with central, sagittate, pale yellow spot outlined by fuscous lines on either side and reddish brown in front; the pale area on either side crossed by two longitudinal vittae: an incomplete one followed by a heavy oblique fuscous ray extending from angle of eye to collar. A pale, lunate spot on either side of vertex, outlined by arcuate fuscous lines, their convexities nearly meeting on the median line. Oblique fuscous lines on frons found in allied forms here becoming confluent. A small spot above base of each antenna and basal third of jugae, pale yellow. Tylus fuscous with apex testaceous and a prominent light yellow spot in the middle. Jugae and lorae largely fuscous, tips pale. Front and sides of head clothed with conspicuous long, pale hairs. Underside of head largely pale yellow. A yellow spot behind each eye at emargination surrounded by a fuscous blotch which invades adjacent area of propleura. Basal joint of antenna fuscous above, mottled with yellow spots, largely pale yellow beneath, bearing a few long pale bristles and many recumbent ones. Second joint fuscous with yellow annulus at base, third fuscous, narrowly pale at either end, fourth fuscous. Rostrum testaceous, tip be-

coming fuscous.

Pronotum rather thickly beset with pale and fuscous, coarse, stiff hairs, these longest on collar, lateral and basal margins. Surface clothed with sericeous golden yellow pubescence and tufts of white, scale-like hairs. Disc brownish testaceous, pruinose, lateral margins and narrow vermiculate lines in region of calli, dark fuscous. Sub-basal line consisting of four fuscous spots bearing conical patches of black setae and interrupted at middle by pale spot; the fuscous areas tending to fuse. Base pale, ornamented with tufts of white scale-like hairs. Collar reddish brown, a pale spot at middle, which extends back between and in front of calli. Propleura dark fuscous, lower margin bordering coxa, a spot above and in front of coxal cleft and xyphus, pale yellow. Mesoscutum broadly exposed, mottled with fuscous; a triangular blackish fuscous spot at each lateral angle, median pale line continuing upon scutellum. Tip of scutellum broadly pale behind blackish fuscous spot on either side of pale median line, the latter overlaid with white scale-like hairs disposed in patches. Vestiture of deciduous, pale yellow pubescence and long fuscous hairs. Sternum and pleura dark fuscous, basalar plate fusco-testaceous, coxal areas and ostiolar peritreme pale yellow.

Hemelytra pale testaceous, mottled with fuscous, bearing many pale and fuscous hairs intermixed with sericeous golden pubescence and ornamented with patches of white, scale-like hairs. Clavus mottled and darkened with fuscous, pale along the commissure. Basal third of corium fuscous, enclosing many round, pale spots. A polished area at the middle separated by a fuscous macula from a similar smooth area at the apex which extends upon the cuneus at outer basal angle. Embolium alternated with pale and fuscous. Corium and cuenus bordering membrane heavily shaded with fuscous and with two blackish dots. These markings combine with the two heavy fuscous clouds, at apical third of hemelytra, to form a distinct "X" when viewed with the unaided eye. Membrane infuscated, paler at middle, with an irregular, pale, transverse band at apical third. Pale areas irrorate with fuscous. Cubitus surrounding apex of large areole, white. Legs pale yellow, femora mottled with fuscous; the fuscous areas enclosing many rounding pale spots of various sizes. Each tibia of each pair with three broad fuscous bands alternated with the pale ground color. Front and middle tarsi fuscous; the hind pair fusco-testaceous. Venter fuscous, paler at middle, rather thickly clothed with long, pale, soft hairs. Genital segment with triangular yellow spot in the middle

near base; fusco-testaceous in central area and apically. Right clasper similar in general form to that of *onustus* but relatively much stouter with dorsal thumb-like process nearly vertical and terete. A prominent, obtusely-angled hump arises just distad of the dorsal process, whereas in *onustus* the dorsal edge is almost linear from the thumb-like process to the distal end.

Female. Similar to male but slightly larger with markings less distinct. Length 6.56 mm., width 2.44 mm. Head: width 1.01 mm., vertex .40 mm. Rostrum 2.86 mm. (flexed) reaching or surpassing sixth ventral segment. Antennae: segment I, length 1.32 mm., II, 2.65 mm., III, 1.21 mm.; IV, .94 mm. Pronotum: length .98 mm., width at base 1.87 mm.

Preferred host plant: redwood, *Sequoia sempervirens* (Lamb.) Endl. Has also been taken on a hemlock, *Tsuga mertensiana* Sarg. planted on the author's property in Eureka. Single-brooded, nymphs appear in July.

Holotype (male): Eureka, Calif., IX.27.52. Allotype (female): same locality, IX.20.41. Paratypes: 6 males, 6 females, all from the type locality, Sept. 2nd to Oct. 9th. All collected by the author, the majority on redwood.

Named for the Yurok Indians, a tribe of the redwood region.

Phytocoris sequoiae n. sp.

Allied to *taxodii* Kngt. but is distinguished by the shorter rostrum, wedge-shaped mark on corium, conspurcate membrane and form of male genital claspers.

Male. Length 6.4 mm., width 2.09 mm. Head: width .98 mm., vertex .25 mm. Rostrum, length 2.79 mm. reaching sixth ventral segment. Antennae: segment I, length 1.16 mm, II, 2.93 mm., III, 1.32 mm., IV, .96 mm. Pronotum: length .85 mm., width at base 1.52 mm.

Elongate, sub-parallel, widest at the cuneus. Eyes very large and prominent, extending to gula on sides of head, with vertex very narrow. Color testaceous, tinged with red, markings fuscous. Dorsum rather evenly set with yellow to black simple hairs, more yellow on margins of embolium and cuneus, intermixed with golden sericeous pubescence and a few white, scale-like hairs. Vague markings on vertex, front and sides of head, red. Head distinctly exserted, clothed with pale hairs, these longest on vertex and front. Basal joint of antenna testaceous, infuscated at apex, dotted with fuscous and red, and bearing many erect pale to fuscous bristles together with shorter recumbent ones. Second joint yellow, lightly

infuscated at tip, obscurely annulated with red and thickly clothed with short golden pubescence. Third and fourth joints yellow, infuscated, golden pilose. Rostrum testaceous yellow, basal joint tinged with red apically, distal joint infuscated.

Disc of pronotum testaceous, anteriorly and laterally tinged with red. Basal submarginal line fuscous, unbroken. Collar set with long bristles. At each anterior angle is an exceedingly long bristle (found only in recently-emerged, perfect examples) extending forward and outward beyond outer basal angle of eye. Propleura pale testaceous, obscurely dotted with red and with a median longitudinal fuscous vitta. Xyphus infuscated. Mesoscutum broadly exposed, testaceous tinged with red, lateral angles darker red, tip yellow. Sternum and pleura fuscous, basalar plate testaceous, infuscated at middle. Coxal area and ostiolar peritreme, pale.

Hemelytra testaceous with very little red except on cuneus. Embolium fuscous, paler at base and apex. Clavus brownish testaceous. Corium with inner apical angle infuscated and with a cuneate, posteriorly narrowing, fuscous mark, extending along claval suture from point opposite tip of scutellum to apex of clavus and with a lateral extension of fuscous coloration to embolar margin at basal third. Radius faintly red. Corium with translucent area at middle, a similar pale area at apex before the cuneus and a black spot bearing concolorous bristles on inner margin in a line with the fracture, followed by another at inner basal angle of cuneus. Cuneus orange-red, edged with yellow outwardly, inner margin and tip infuscated. Membrane lightly infumated, conspurcate with fuscous, the spots tending to coalesce basally and apically. Cubitus pale red.

Legs testaceous, upper surface of femora mottled with fuscous and red, the dark coloration on the hind pair enclosing many rounding pale spots of various sizes. Front tibiae triannulate with fuscous, middle and hind pair without rings. Venter testaceous mottled with fuscous and red, sparsely clothed with moderately long, pale hairs. Genital segment infuscated at base, paler laterally and apically. Tubercles absent. Right clasper very similar in form to that of *P. rubellus* Kngt. Left clasper of the type found in related forms but basally enlarged as in the species closest to *onustus*.

Female. Similar to male but elongate-oval, widest before the cuneus, eyes relatively smaller and the insect strongly suffused with rufous coloration. Length 6.50 mm., width 2 mm. Head width .91 mm., vertex .35 mm. Rostrum 2.85 mm. reaching or surpassing fifth ventral segment. Antennae: segment I, 1.27 mm., II, 2.78

mm., III, 1.32 mm., IV, .84 mm. Pronotum: length .84 mm., width at base 1.53 mm.

Host plant: redwood, *Sequoia sempervirens* (Lamb.) Endl. Single-brooded, nymphs appear in July.

Holotype (male): Eureka, Calif., IX.7.52. Allotype (female): same locality, X.1.49. Paratypes: 25 males, 25 females, Eureka, Aug. 28th to Nov. 6th. Specimens at hand from Shively and Grizzly Cr., Humboldt Co., Calif. All collected on the host plant by the author.

Cicadellidae

Idiocerus wiyotus n. sp.

Resembling *amoenus* V. D. but larger, with elongate antennal discs and extensive black markings in the male. Length 5.3–5.6 mm. Width 1.72–1.82 mm.

Face long as in *suturalis* Fh. with the genae nearly straight-margined and exceeded by the apically expanded clypellus. Clypeus convex. Male antennal discs elongate-oval, 2½ times as long as wide. Female seventh sternite a little produced at middle, trisinuate, relatively long.

Color of body and legs bright green in life, sometimes fading to yellow. Eyes dark brown. Pronotum and scutellum fulvous. Male face and vertex green, or yellowish in some dried specimens, with a brown stripe beneath either eye. Female face unicolorous, green or yellowish, the vertex fulvous. Male usually with four small black spots arranged in a forwardly arcuated semicircle on pronotum near anterior margin. Scutellum with heavy black triangles and two black median spots on disc. Black markings lacking in female, scutellar triangles being represented by a darkening of the ground color. Tip of scutellum green, elytra pale brownish, subhyaline, scutellar and sutural margins infuscated, white saddle-mark absent.

Host plant: redwood, *Sequoia sempervirens* (Lamb.) Endl.

Holotype (male): Shively, Humboldt Co., Calif., VIII.2.53. Allotype (female): same locality, VII.19.53. Paratypes: 22 males, 16 females from type locality, June 21st to Aug. 28th. All collected on the host plant by the author.

Named for the Wiyot Indians, a peaceful tribe of the Humboldt Bay area.

Idiocerus shivelyanus n. sp.

Related to *amabilis* Ball but slightly narrower and more highly ornamented with black, white, ivory and brown. Male antennal

discs long and narrow, female ovipositor distinctly exceeding the long narrow pygofers. Length 5.6–6 mm. Width 1.85–1.97 mm.

Male face broad, the genae laterally sinuate, shorter than clypellus. Clypeus broadly, shallowly, longitudinally excavated in middle, giving the face a concave appearance. Antennal discs long and pointed at each end, three times as long as wide. Female face convex. Seventh sternite slightly produced at middle, trisinuate, not differing significantly from that of *wiyotus* n. sp. Ovipositor surpassing pygofers by 1½ times its own width.

Color: male with body and legs bright green in life, fading to yellow. Vertex, a broad longitudinal stripe covering central depressed area of clypeus, clypellus, outer basal angles of jugae and tips of lorae, green in life, sometimes fading to yellow in dried specimens. Lorae, wide outer margins of clypeus, and ocellar area of frons, ivory. A wide stripe beneath each eye, a narrower pair on lorae bordering base of clypellus, a pair bordering green central area of clypeus and a median stripe on vertex and frons, brown. Disc of pronotum testaceous brown, anterior margin broadly green to yellow. Median longitudinal stripe, one large and a variable number of smaller spots on either side of disc and narrow posterior as well as lateral margins, sordid white. Scutellum testaceous with heavy black basal triangles and a round, black spot on either side of transverse groove. A short stripe on each side of median line at base, a lunate mark bordering transverse groove on either side anteriorly and a broad median stripe running from transverse groove to tip of scutellum, ivory. In some specimens, median, apical, ivory stripe is outlined with black or fuscous on either side. Elytra pale brown, translucent, with a white saddle-mark. Costal area concolorous, apices lightly infumated. Female face green to yellow. Vertex, centrally, and frons testaceous with a transverse whitish stripe from eye to eye across ocelli. A median longitudinal stripe on vertex and a round spot on each side, white. Scutellum with basal triangles dark brown, round spots on disc lacking. A broad stripe on either side of median line, anterior to transverse groove, and a single median stripe from transverse groove to apex of scutellum, ivory. Otherwise colored as in the male.

Host plant: redwood, *Sequoia sempervirens* (Lamb.) Endl.

Holotype (male): Shively, Humboldt Co., Calif., VIII.3.52. Allotype (female): same locality, VIII.31.52. Paratypes: 5 males, 11 females from the type locality, July 12th to Sept. 5th. All collected on the host plant by the author.

Idiocerus laribaeus n. sp.

Resembling *nervatus* V. D. but larger with large yellowish triangles on scutellum. Bright green in color rather than pallid. Male antennae banded with black, white and fuscous. Never occurs on willows although the latter grow abundantly in the type locality. Length 4.8–5.12 mm. Width 1.57–1.72 mm.

Clypeus convex, lateral margins not elevated. Vertex broadly arcuated, base and anterior margin parallel, as long in the middle as next to an eye. Hind margin of pronotum broadly angulated with a broadly v-shaped notch at middle, sides flaring and covering a large portion of the scutellar triangles. Each male antennal disc rather small, oval, on a very stout filament, the latter appreciably thickened at base and distally, constricted in the middle. Female seventh sternite slightly produced at middle, trisinuate, scarcely distinguishable from that of *wiyotus* n. sp.

Color bright green. Eyes, tarsal claws and tip of rostrum, black, sharply contrasting. Scutellum with large yellow or dark green triangles. Dark markings of mesoscutum showing through the translucent surface of pronotum. Elytra greenish hyaline the commissural margins and nervures becoming infuscated apically in the male. Apices lightly infumated. Males with a fuscous dash on the first cross nervure before the discal cell, this lacking in the female. Filament of antennal disc with wide fuscous band near proximal end, distal portion, including pointed tip of disc, whitish. Disc black. Distal style, in the unbroken state longer than antennal disc, black proximally, whitish apically. Sutural margins in female concolorous, green throughout. Apical nervures not so strongly infuscated as in the male and apices less infumated.

Host plant: redwood, *Sequoia sempervirens* (Lamb.) Endl.

Holotype (male): Shively, Humboldt Co., Calif., IX.28.52. Allotype (female): same locality VIII.30.53. Paratypes: 3 males, 11 females from the type locality, Aug. 23rd to Nov. 26th. All collected on the host plant by the author.

Colladonus holmesi n. sp.

Resembling *aureolus* V. D. in the sharply angled vertex but very distinct in its saffron yellow and red color pattern. Length 4.8–6.1 mm. Width of head 1.29–1.49 mm.

Apex of head, viewed in profile, sharply conical, dorso-lateral margins of head including eyes forming nearly straight lines, converging at a little more than a right angle. Head and pronotum

subequal in width. Pronotum 1½ times length of vertex. Vertex 1½ times as wide as long. Pronotum twice as wide as long. Hind margin of vertex subcarinate, abruptly, distinctly, elevated, especially in the male. Combined male plates somewhat spoon-shaped, unusually broad, the lateral margins strongly sinuate and forming a distinct lobe near base on either side. Female seventh sternite with ligulate process rather constant in form, slightly constricted at middle, notched at tip and subequal to lateral lobes, the latter usually shallowly emarginate at apices.

Color croceous, the ventral surface intensely so. Eyes and ocelli dark red. Sides of clypeus tinted with red, sometimes forming short arcs of a deeper red on either side, visible through the red suffusion. Scutellum with basal triangles often indicated by a darkening of the ground color. Elytra translucent, of a uniform, iridescent, golden hue throughout Hind wings pale but strongly iridescent. Females usually with two white chevrons along the commissure, these lacking in the males. Ovipositor often reddened on the sides.

Host plant: redwood, *Sequoia sempervirens* (Lamb.) Endl.

Holotype (male): Shively, Humboldt Co., Calif., IX.6.53. Allotype (female): same locality, VIII.28.53. Paratypes: 5 males, 8 females from the type locality, Aug. 9th to Oct. 5th. All collected on the host plant by the author.

Colladonus eurekae n. sp.

Related to *holmesi* n. sp. but darker with a bluntly angled vertex and male plates without lobes. Brown and yellow with hind wings infumated. Length 4.65–5.95 mm. Width of head 1.23–1.51 mm.

Vertex short, bluntly rounded, twice as wide as long. Head slightly wider than pronotum. Pronotum twice as long as vertex. Width of pronotum about twice its length. Combined male plates spoon-shaped, broad at base, the lateral margins sinuate but not strongly lobed. Female seventh sternite with ligulate process characteristic in shape, wide and flat, broad at base, narrowing apically, scarcely notched at tip and usually longer than the lateral lobes.

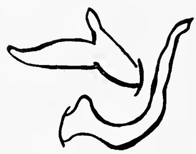
Color: (males) face, vertex, pronotum, scutellum, legs, genital segments and often one or two preceding, yellow. Eyes dark brown. Triangles sometimes indicated on scutellum by a darkening of the ground color, at basal angles. Elytra iridescent, brownish, translucent, costal area concolorous, scutellar margins sometimes yellowish. Hind wings infumated, highly iridescent. Tergum and venter black with blue reflections, segments margined

with yellow, the latter variable in extent. Hind tibia with conspicuous dark line on inside. Females brownish yellow; without the dark line on hind tibia. Tergum and venter concolorous, segments margined with pale yellow behind, with often a pair of dark spots medially on third, fourth and fifth sternites, respectively, the last pair faint or lacking in some specimens.

Host plant: redwood, *Sequoia sempervirens* (Lamb.) Endl.

Holotype (male): Eureka, Calif., VIII.16.52. Allotype (female): same locality, X.5.53. Paratypes: 4 males from the type locality, 2 males from Shively, Calif., 16 females from type locality. Aug. 3rd to Oct. 22d. All collected on the host plant by the author.

1



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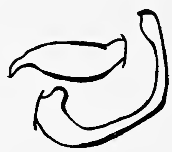

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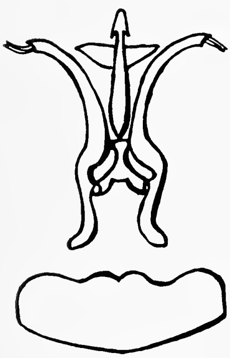

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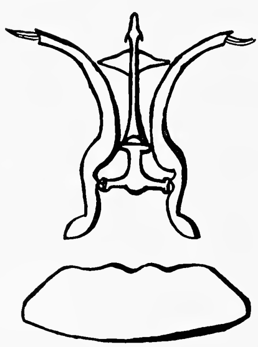

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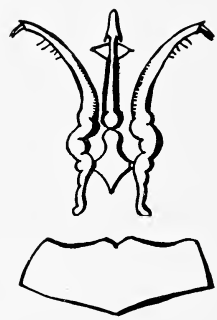

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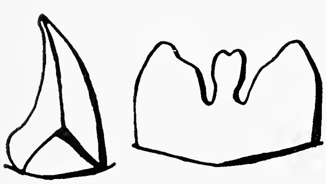

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8

Explanation of textfigures on page 118.

1: Caudal view of right (above) and left male genital claspers of *Dichrooscytus sequoiae* n. sp. 2: Lateral view of right (above) and left male genital claspers of *Phytocoris yuroki* n. sp. 3: Lateral view of right (above) and left male genital claspers of *Phytocoris sequoiae* n. sp. 4: Male styles and aedeagus (above) and female seventh sternite of *Idiocerus wiyotus* n. sp. 5: Male styles and aedeagus (above) and female seventh sternite of *Idiocerus shivelyanus* n. sp. 6: Male styles and aedeagus (above) and female seventh sternite of *Idiocerus laribaeus* n. sp. 7: *Colladonus holmesi* n. sp. Male plates viewed from beneath and to one side, showing lateral margin of a plate. Female seventh sternite at right. 8: *Colladonus eurekae* n. sp. Male plates viewed from beneath and to one side, showing lateral margin of a plate. Female seventh sternite at right.

PUBLICATIONS RECEIVED

Insect Fact and Folklore, by Lucy Clausen. 194 pp., 45 illustrations. 6 x 9 ins., cloth bound. 1954. The Macmillan Co., New York, N. Y. (Price, $3.50.)

The Water Beetles of Florida, by Frank N. Young. 238 pp., 31 textfigures. 7 x 10 ins., paper bound. 1954. University of Florida Press, Gainesville, Florida. (Price, $6.00.)

THE IDENTITY OF HOMOPTERA LINEOSA WALKER (LEPIDOPTERA, NOCTUIDAE, CATOCALINAE).

By John G. Franclemont[1] Ithaca, New York.

I have recently reëxamined the photograph of the type of *Homoptera lineosa* Walker, 1857 (List of the Specimens of Lepidopterous Insects in the Collection of the British Museum), and I am convinced that it represents a somewhat worn specimen, with a repaired abdomen, of *Zale minerea* Guenée, 1852. Thus, *lineosa* Walker should be cited as a synonym of the Guenée species, and the species I called *lineosa* (Bulletin of the Brooklyn Entomological Society, vol. 45, p. 153, 1950) should be called *Zale galbanata* (Morrison), [1876], with *penna* (Morrison), 1876, as cited there, a synonym.

I do not know, at present, of any way of determining the exact locality at which the type of *lineosa* was collected. Walker gives the locality as "United States" and the donor as "E. Doubleday." *Zale minerea* is primarily a spring species in areas where I have collected; in southeastern Alabama it is on the wing in late March and early April, in coastal Virginia during May, and at Ithaca, New York from the first third of May through early June. Edward Doubleday collected in New York State during the season of 1837; he was at Hudson in early May and at Trenton Falls from mid May until the end of August. In the spring of 1838 he was at St. John's Bluff, Florida. I believe that the type of *lineosa* was taken at light at Trenton Falls, New York. It could have been caught in Florida, but from my experience, *minerea* is not as common in the southern parts of its range as in the northern parts.

Fig. 1. *Homoptera lineosa* Walker, TYPE. Photograph by W. H. T. Tams of the British Museum (Natural History), London, England.

[1] Department of Entomology, Cornell University.

EXCHANGES AND FOR SALE.

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Vol. XLIX DECEMBER, 1954 No. 5

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CONTENTS

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BULLETIN

OF THE

BROOKLYN ENTOMOLOGICAL SOCIETY

Vol. XLIX DECEMBER, 1954 No. 5

NEW SPECIES OF HYDROPTILIDAE (TRICHOPTERA).

By R. L. Blickle and W. J. Morse,[1] Durham, New Hampshire.

Several species of undescribed Trichoptera have been taken in light traps in New Hampshire during the past few years. Among these were species of the genera *Hydroptila* and *Oxyethira*. The following seven new descriptions are based on male genitalia. Holotypes will be placed in the Illinois Natural History Museum, Urbana, Illinois. Paratypes will be placed in the above named museum and the Collection of the University of New Hampshire.

Oxyethira rivicola n. sp.

Male: length from front of head to tip of wings 3 mm. This species is closely related to *O. grisea* Betten, *O. lumosa* Ross, and *O. novasota* Ross. Seventh sternite with a sharp, apico-mesal spur, Fig. 1S. Eighth segment with a stout, dark, apico-lateral spine. Genitalia as in Fig. 1. Subgenital plate hook shaped in lateral view, curved and pointed at the tip. Claspers fused, slightly concave on the meson, the ventral margin armed with a cluster of setae. Aedeagus, Fig. 1B, 0.5 mm. long; the spiral process encircles the aedeagus one and one half times. The apex of the aedeagus is divided into a sclerotized lobe and a semi-sclerotized lobe. The smaller lobe appearing pointed in some views, the dorsal side of this lobe is covered with small denticles, Fig. 1B1. The larger lobe is semicircular with margin crenulated when viewed laterally.

Holotype male: Lee, N. H., June 22, 1948, light trap. Para-

[1] Contribution No. 159 of the New Hampshire Agricultural Experiment Station.

types: Lee, N. H., June 22, 1948, ten males; Durham, N. H., July 8, 1951, fourteen males; Sept. 22, 1951, one male; Plymouth, N. H., June 24, 1948, three males; July 31, 1951, three males.

Oxyethira sida n. sp.

Male: length from front of head to tip of wings 3 mm. This species is closely related to *O. rivicola,* described above. Seventh sternite with a sharp apico-mesal spur. Genitalia as in Fig. 2. Subgenital plate moderately sclerotized, broad at base and tapering sinuately to a pointed apex. Claspers fused on meson. Style sinuate, tipped with a long spine. Aedeagus, Fig. 2B, 0.43 mm. long. Spiral process encircles the aedeagus one and one half times and is longer than the main portion of the aedeagus, tip curved acutely. Apex of the aedeagus expanded, divided into two fingerlike, sclerotized lobes.

Holotype male: Lee, N. H., June 22, 1948, light trap. Paratypes: Lee: N. H., June 22, 1948, four males; Durham, N. H., July 7, 1951, five males; Sept. 22, 1951, three males.

Oxyethira michiganensis Mosely

Originally described by Mosely (1934) with the type locality listed as "Michigan." It is possible that the actual type locality may be the "Michigan Preserve" an area some twenty to thirty miles south of Ithaca, New York. This information was obtained through correspondence with Dr. Cornelius Betten. Dr. H. H. Ross of Illinois has informed us that *O. michiganensis* has not been taken in Michigan although Dr. J. W. Leonard of Michigan has collected extensively there for fifteen years.

Male: length from front of head to tip of wings 3.5 mm. Seventh sternite with a short, sharp apico-mesal spur. Apico-lateral margin of the eighth segment bearing a long process, Fig. 3A; a very long seta projecting from the tip of the process directed dorsad. This process with its seta has a "whiplike" appearance. Ninth sternite with numerous heavy setae apically, sternite rounded to an apicomesal lobe. The posterior margin of the ninth sternite crenate in outline. Genitalia as in Fig. 3. Subgenital plate moderately sclerotized, curved, forming a semicircle in lateral view. Style sinuate, long, tipped with a short seta. In ventral aspect the subgenital plate somewhat U-shaped, the base connected, the apex divided into a pair of lobes directed mesad and not quite touching, Fig. 3C. Aedeagus 0.4 mm. long, Fig. 3B. Spiral process reaching almost to the tip of the aedeagus and encircling it for three

quarters of a revolution.

One hundred and fourteen specimens taken from the following New Hampshire localities: Durham, Hopkington, Lee, and Plymouth. July 8 to September 24.

Hydroptila lonchera n. sp.

Male: length from front of head to tip of wings 2.75 mm. Seventh sternite with a short apico-mesal process. Eighth tergite, lateral view, Fig. 4A, with from three to five long, heavily pigmented spines on each apico-lateral margin; the spines are slightly more than one half the length of the eighth segment. In dorsal view, Fig. 4D, the eighth tergite is deeply incised and the spines are curved toward the meson. Apical margin of the eighth segment with numerous long setae. Genitalia as in Fig. 4. Tenth tergite, laterally, appears as a long arm projecting dorsad at an angle of thirty degrees, the apex of the arm membranous and expanded. In dorsal view, Fig. 4D, the tenth tergite appears as two long arms tapering gradually to an ovate apex. Claspers long, wider at base than apex, dorsal margin slightly concave, ventral margin irregular and toothed, Figures 4A and 4C. Aedeagus, Fig. 4B, 0.6 mm. long, base as long as apex and much expanded; spiral process encircling the neck of the aedeagus a little over one revolution and forming a crude figure eight.

This species will key out in Ross (1944) with those species having a short process on the seventh sternite. The aedeagus being similar to that of *H. grandiosa* Ross and *H. scolops* Ross.

Holotype male: Lee, N. H., August 15, 1948, light trap. Paratypes: Lee, N. H., August 25, 1948, five males; Durham, N. H., August 10, 11, and 14, 1951, five males.

Hydroptila spinata n. sp.

Male: length from front of head to tip of wings 3 mm. This species is similar to *H. callia* Denning, however, it is easily distinguished from it by the short process on the seventh sternite and the row of spines on the eighth sternite. The seventh sternite bears a sharp apico-mesal spur, Fig. 5S, which attains the eighth segment. Eighth sternite in lateral view, projecting forward beneath the ninth; a row of heavily pigmented, stout spines along the apico-mesal margin of the eighth sternite. Genitalia as in Fig. 5. Tenth tergite, Fig. 5D, incised apically, the divided tips pointed, the tergite approximately the same width throughout its length in dorsal aspect. Claspers, Fig. 5E, long, wide at base, abruptly

narrowed apically; the long slender apical portion curved ventrally; two setae on the dorso-lateral margin, outer setae twice as long as inner. Aedeagus, Fig. 5B, 0.60 mm. long, base wide, narrowing immediately below neck; apex divided into three long parts. Spiral process, shortest of the apical parts, encircling the aedeagus for one half turn, curved at tip. Main part slightly sinuate, apical third marked giving it a spirally threaded appearance. Third part straight, tapering gradually to apex.

Holotype male: Lee, N. H., July 12, 1947, light trap. Paratypes: Lee, N. H., July 12, 1947, one male; August 6, 1947, two males; June 14, 1948, two males; August 25, 1948, one male; Plymouth, N. H., June 30, 1953, one male.

Hydroptila novicola n. sp.

Male: length from front of head to tip of wings 2.5 mm. long. This species is closely related to *H. quinola* Ross. Seventh sternite with a short, sharp process. Genitalia as in Fig. 6. Subgenital plate, in ventral view, triangular, apex slightly forked, two spines at the apical one fifth of the plate. Claspers, ventral view, long with base broad and tapering to apex. A seta on the outer basal margin of each clasper. Aedeagus, Fig. 6B, 0.55 mm. long, basal portion longer than apical; base narrowing to neck, neck wide and round, apical and basal parts articulated in a ball and socket arrangement; apical portion tapering to pointed apex. Spiral process short and thin, encircling the narrow part almost completely and extending for a short distance along the apical part.

Holotype male: Durham, N. H., July 8, 1951, light trap. Paratypes: Durham, N. H., July 8, 1951, two males; Plymouth, N. H., June 30, 1953, two males.

Hydroptila remita n. sp.

Male: length from front of head to tip of wings 3 mm. This species is related to *H. ampoda* Ross. Seventh sternite with a long apico-mesal process, Fig. 7S, tip of process curved, small serrations on apical margin. Internal part of ninth segment very long. Genitalia as in Fig. 7. Tenth tergite, in dorsal view, widest at middle and tapering to apex, Fig. 7D; apex emarginate. Base of tenth tergite two-thirds as wide as at the middle, apex one half as wide as at middle. Claspers sabre shaped, directed ventrad, base of clasper with dorsal projection bearing several long setae. Aedeagus, Fig. 7B, 0.80 mm. long. The two apical parts of the aedeagus entwined, Fig. 7BA. Apex of the main portion marked giving it

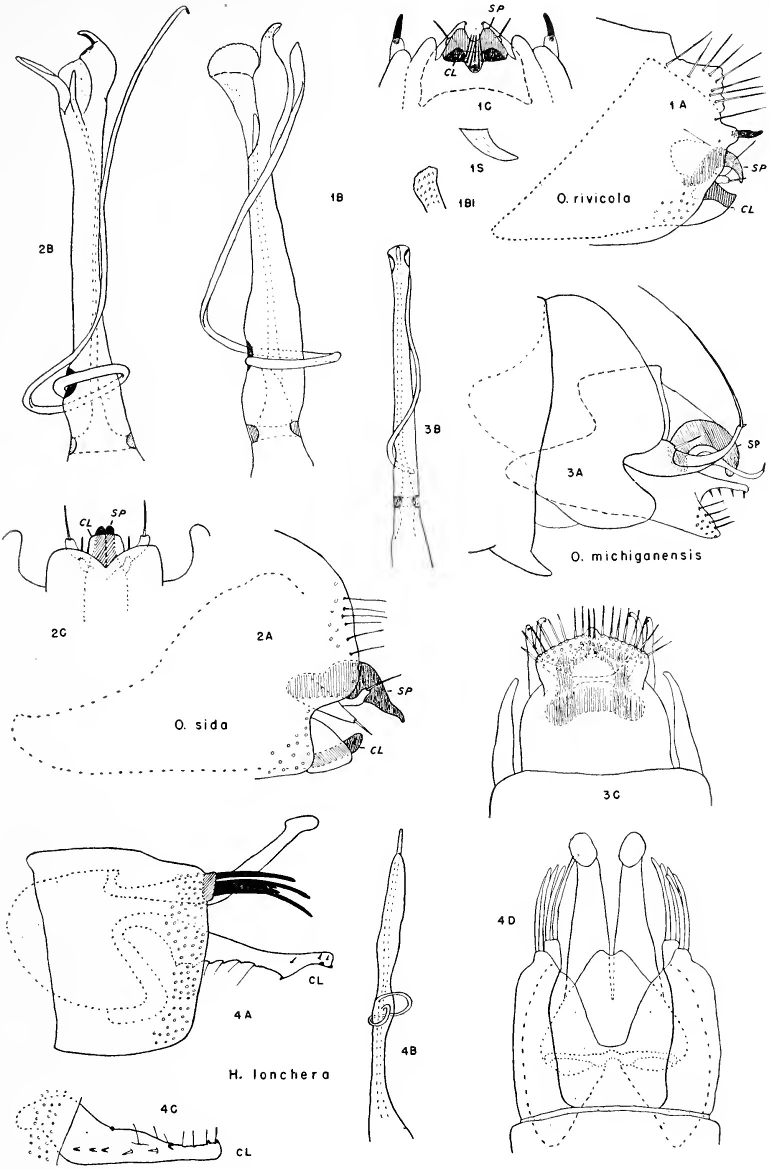

Plate V. *Oxyethira* and *Hydroptila,* male genitalia. *A,* lateral view. *B,* aedeagus. *C,* ventral. *D,* dorsal. *Sp,* subgenital plate. *Cl,* clasper.

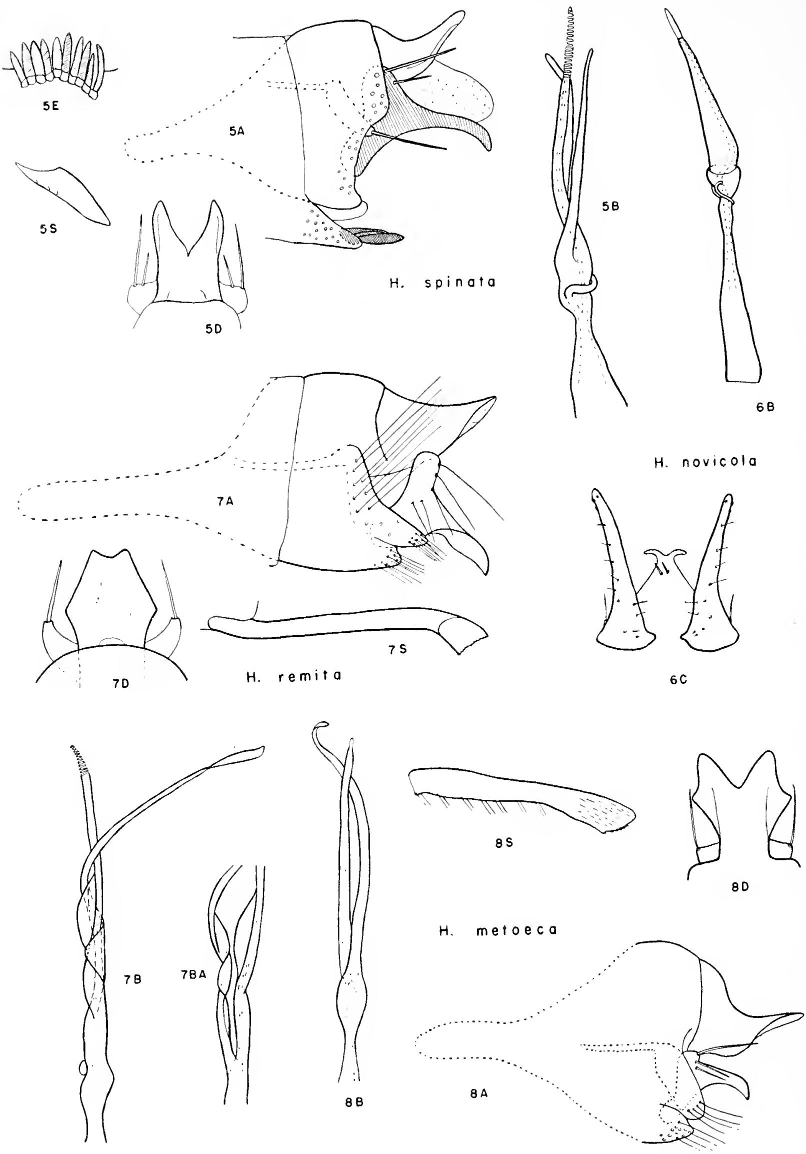

Plate VI. *Hydroptila,* male genitalia. *A,* lateral. *B,* aedeagus. *D,* dorsal. *S,* spine on seventh sternite. *E,* spines on eighth sternite.

a spirally threaded appearance. Spiral process long and curving away from main part.

Holotype male: Durham, N. H., Sept. 22, 1951, light trap.

Hydroptila metoeca n. sp.

Male: length from front of head to tip of wings 3.1 mm. long. Apico-mesal process of seventh sternite long, Fig. 8S, seven pairs of small hairs on the ventral margin of process. Genitalia as in Fig. 8. Tenth tergite narrow at base, Fig. 8D, widest about three fifths distant from base, slightly narrowed at apex, cleft apically for about one third the length of the segment. Clasper sabre shaped with a small dorsal projection. Aedeagus long, Fig. 8B, base and apex equal in length, apical part divided; spiral process curved about the shorter, straight main part.

This species is similar to *H. hamata* Morton. It is easily separated by the following: tenth tergite flared beyond the middle and incised more deeply; the spiral process being longer than the main part of the aedeagus; tip of the spiral process being curved evenly, in *H. hamata* the tip of the process is bent at right angles to the main process. The process on the seventh sternite is longer in *H. hamata.*

Holotype male: Lee, N. H., June 14, 1948, light trap. Paratypes: Lee, N. H., June 14, 1948, fourteen males; Durham, N. H., August 24–27, 1951, eight males; Plymouth, N. H., August 31, 1953, one male.

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Ross, H. H. 1944. The caddisflies, or Trichoptera, of Illinois. Ill. Nat. Hist. Surv. Bull. 23(1): 1–326.

PUBLICATIONS RECEIVED

Mature Larvae of the Beetle-Family Anobiidae, by Adam G. Boving. 298 pp., 50 plates. 6 × 9 ins., paper bound. 1954. Det Kongelige Danske Videnskabernes Selskab, Norregade 6, Copenhague K, Danemark.

SEASONAL DISTRIBUTION OF SOME TENNESSEE TABANINAE (DIPTERA, TABANIDAE).

By L. L. Pechuman, Lockport, New York.

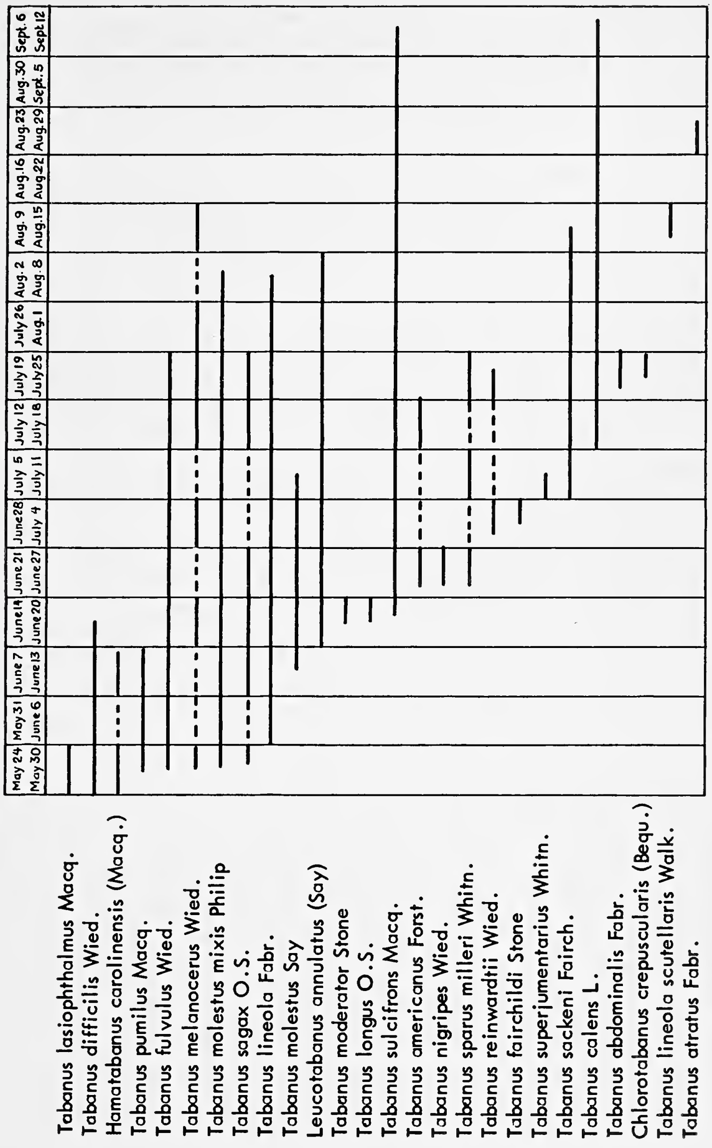
Through the kindness of Prof. Henry Dietrich of Cornell University, the writer recently had the opportunity of studying an extensive collection of Tabaninae collected in 1953 at Burrville, Morgan County, Tennessee, by Mr. Bernard Benesh.

Little is known of the tabanid fauna of Tennessee and it was intended originally to prepare a list of the species in this collection which had not previously been reported from that state. However, since some species were present in long series, representing collections made every day for a period in excess of three months, it was thought that a chart showing the seasonal distribution as represented in this collection would be a more effective way of presenting this information. Certain species were represented by small numbers and probably the collection records are of little significance in these cases; such species include *Tabanus americanus, atratus, fairchildi, lineola scutellaris, longus* and *moderator* and *Chlorotabanus crepuscularis.* In the case of other species, the series were so extensive that probably their true seasonal distribution is well indicated on the chart; such species include *Tabanus calens* (73 specimens), *fulvulus* (187 specimens) and *molestus mixis* (149 specimens). There were no males in the material studied.

A fairly long series of *Tabanus sagax* showed more variation than is usually associated with that species in the shape of the third antennal segment; this was fairly broad in some specimens. All the specimens of *Tabanus lineola* were a melanistic form of that species. The *Tabanus melanocerus* specimens were unusually large and dark and approached *lacustris* Stone in the extent of the dark coloration of the hind femora. However, the spur at the bifurcation of the third longitudinal vein, as is found in *lacustris,* was lacking with the exception of one specimen with almost completely dark femora where the spur was present in one wing only.

As is frequently encountered in long series, a number of *Tabanus sulcifrons* showed characters usually associated with *T. abdominalis* such as closed and petiolate first posterior cell and narrow frons. Only those specimens which met the following four criteria were considered to be *T. abdominalis:* very narrow frons, closed first posterior cell, no evident abdominal triangles and wholly black femora. Certain specimens showed as many as three of these

SEASONAL DISTRIBUTION OF SOME TENNESSEE TABANINAE



* Species not previously recorded from Tennessee

characters in various combinations but were considered to be *T. sulcifrons*.

It is interesting to note that no specimens of subspecies *pallidescens* Philip were present in the 187 specimens of *T. fulvulus* examined although this form has been collected in Tennessee. There were no intergrades between the 27 specimens of *T. molestus* and 149 of subspecies *mixis*. The series of *T. molestus mixis* showed considerable variation in width and shape of frons and in the shape of the basal portion of the third antennal segment.

The cooperation of Prof. Dietrich and Mr. Benesh in making this interesting collection available is appreciated. I am indebted to Mr. William Wild of the Buffalo Museum of Science for the preparation of the accompanying distribution chart.

A STUDY OF THE BIOLOGY OF PRIOCNEMIS MINORATA BANKS (HYMENOPTERA, POMPILIDAE).

By Carl M. Yoshimoto,[1] Ithaca, New York.

In the spring of 1953, I had an opportunity to make several observations on the nesting habits of *Priocnemis* (*Priocnemis*) *minorata* Banks near Ithaca, N.Y. Most of my studies were made at Bull Pasture Pond, about two miles northeast of the Cornell University campus. The environment is a typical open oak-maple woodland with a pond nearby; part of the land has been cleared for a golf course. The ground is thickly covered with dry leaves and twigs where *P. minorata* nested. Two observations were made at McLean Wildlife Reservation, about 14 miles east of Ithaca, in a wooded area.

There have been no previous publications on the habits of this species, or any other member of this subgenus, in North America. My sincere thanks go to Dr. H. E. Evans for identification of the pompilid and some additional notes on its biology. I also wish to express my thanks to Dr. Willis J. Gertsch of the American Museum of Natural History for the identifications of the spiders.

The ten separate observations bear note numbers 401 through 410. Reference is made to these numbers in the text; the field notes and associated specimens are on file at Cornell University.

[1] Cornell University.

Usually the writer spent at least six hours per day in the field to record the nesting activity of only one individual. Occasionally two or three individuals were observed nesting on warm sunny days (approximately 78° F.). After a few observations, the height of the nesting activity was correlated with the temperature and the time of day. On a sunny day (70°–80° F.), the peaks of activity were from 9:30 a.m. to 11:00 a.m. and from 3:30 p.m. to 6:00 p.m. On cool and cloudy days, there was very little activity, and on rainy days *minorata* would seek shelter in her nest or under the dried leaves on the ground.

P. minorata appears at Ithaca early in the spring, and for some weeks is the only species of pompilid present. Males have been collected at Ithaca from April 13 through May 11. The females appear approximately a week later than the males. Dates of females collected at Ithaca range from April 21 to June 14. During the span of the adult life, both males and females occasionally visit flowers for nectar; specimens have been taken by H. E. Evans on choke cherry, *Prunus virginiana* L., and on the catkins of willows, *Salix sp.*

Hunting

Many females were observed hunting their prey during the course of these studies. The wasp flickers her wings constantly when hunting for prey; this is characteristic of most members of this family. The antennae vibrate close to the ground as the wasp searches above and under fallen leaves and ground litter. Occasionally, short (.5–1 meter) and long (3–5 meters) flights are made to seek for better hunting ground. In none of my observations did I detect the manner in which the female wasp captures her prey.

Fifteen spiders were taken from wasps or from the cells and submitted for identification; nine others were used for rearing larvae. These specimens represent six species belonging to four families: Agelenidae, Anyphaenidae, Clubionidae, and Lycosidae (see table 1). All of the spiders were adult females except for the two indicated.

In order to study the variation in weight of the spiders taken, I selected two paralyzed spiders of extreme size and weighed them. The largest spider (no. 404, cell 4, *Wadotes hybridus* Emerton, female) weighed 404 mg. and the smallest (no. 404, cell 5, *Wadotes hybridus* Emerton, female) weighed 55 mg.

Table 1

List of spiders taken as prey by *Priocnemis minorata* Banks

Agelenidae

Coras juvenilis Keyserling, imm. female
Wadotes calcaratus Keyserling, female
Wadotes hybridus Emerton, female

Anyphaenidae

Aysha gracilis Hentz, female

Clubionidae

Clubiona obesa Hentz, female

Lycosidae

Trochosa pratensis Emerton, female

Transportation

The first nesting activity of *P. minorata* was observed on May 9, 1953, when I accidentally came across a female *minorata* with her spider (no. 401). In this and later examples observed, the wasp always transported her prey by walking backward, grasping the spider in her mandibles by the hind coxae in an upright position. The body of the spider is thus perpendicular to the wasp's body, forming a "T." In many cases, the prey outweighs the wasp many times, and the wasp drags the prey instead of holding it in mid-air. In several cases, the wasp traveled a considerable distance to her nest (6 to 10 meters). In a few exceptional cases, the female wasp traveled over ten meters with her prey. During the journey to the nest, the wasp may pause several times, the number of times being more or less proportional to the distance from the place of capture to the nest. During her brief stops, she either holds the prey with her mandibles and remains motionless, or deposits the spider and cleans her antennae and mouth parts with her fore legs. One wasp (no. 401) made an attempt to climb backward on a stiff grade (60° angle) of an old dry leaf with a large prey. She took several minutes struggling to get on the other side of the leaf. In another case (no. 403), a wasp walked backward up a young tree (one meter) but did not fly with her large prey. After reaching the top of the plant, she walked forward toward the ground and continued her journey.

During the process of transporting the prey, one female wasp (no. 402) met another female wasp. The intruder tried to steal

the prey away by pulling one of the spider's legs. The defender abandoned her grip on the spider and jumped on the intruder's back. A moment later, both tumbled over and over on the ground. Then a few seconds later after the violent struggle, the defender regained control of the prey and chased the intruder away with her wings vibrating in a diagonal position.

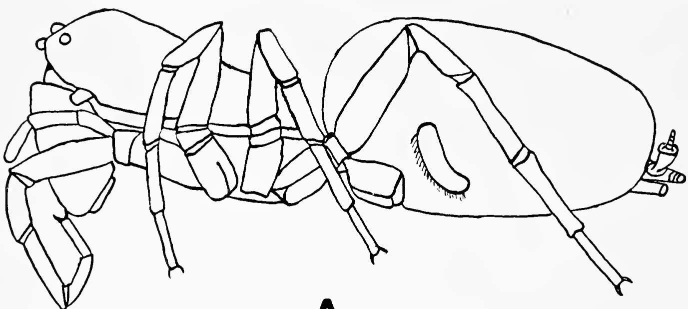
The female *minorata* has an excellent memory for the location of her nest. In no case observed was an individual seen to deposit her prey to make exploratory trips forward in the direction of the nest, as is so often done by the related species, *Priocnemis* (*Myrmecosalius*) *cornica* (Say). No matter what the distance might be, *minorata* always proceeded directly to the nest in almost a straight line. This seems all the more remarkable when it is recalled that the wasp is walking backward over a rough bed of leaves and sticks.

Nesting Activities

The manner in which minorata constructs the nest was never observed, the reason being that the species digs the nest beneath dried fallen leaves and nothing can be seen from above. The first nests were discovered by watching several individuals (nos. 401, 403, 404) with their prey. After placing the prey on the top of a leaf, each of these wasps entered the pile of leaves and came out a minute later and grasped the spider's third coxa and walked between the leaves and disappeared below. The leaves were removed immediately from the area. In each case the female wasp entered the burrow to make an inspection trip, leaving the spider near the entrance. After the inspection trip, the wasp came halfway out the entrance and grasped the spider by its spinnerets and dragged it backward into the burrow. Female wasps which got their prey during the later afternoon usually confined themselves in the nest the rest of the day. After some experience, nests could easily be spotted under the dried leaves. The nest entrance is left opened during the entire duration of nesting. The entrance is a hole about .7 cm. in diameter surrounded by rim of ferruginous and cream-colored clay-loam soil which is dug from the burrow, giving somewhat the appearance of an ant hill.

On May 10, at Bull Pasture Pond, I saw a *minorata* carrying a spider (no. 404) to her nest in the same manner as mentioned above. She left the prey next to the entrance and entered the burrow. I took the prey and kept it as a prey record. Several hours later, I dug out the nest and found seven cells (fig. B). I started

to dig 15 cm. away from the hole to a depth of 30 cm. below the ground level and gradually worked inward and followed toward the top. There were hardly any pebbles or roots in the nest area. I located the cells in ascending order. A medium size larva feeding on a *Wadotes hybridus* was found in the first cell, perpendicular to the earth surface and at a depth of 25 cm. The second cell was 2.5 cm. to the left and slightly above the first cell; this contained a slightly smaller larva feeding on another spider, *Aysha gracilis*. As I dug 1.5 cm. higher and considerably to the right, the third cell was discovered; in this cell there was a very small larvae feeding on a *W. hybridus*. The fourth cell was found on the opposite side, 2.5 cm. above the second cell; this contained another *W. hybridus* with an egg laid on its abdomen. The fifth cell was dis-



A

Fig. A—A typical position of the egg on the abdomen of *Wadotes hybridus* Emerton, female (no. 404, cell 1).

covered above the third cell; this cell contained a medium *W. hybridus* with an egg on its abdomen. The sixth cell was located 4 cm. above the fourth cell and 4 cm. from the end of the open part of the burrow; this contained a small yellow-reddish spider, probably *Trochosa pratensis*, with an egg on its abdomen. The topmost cell with a fresh egg laid on the spider's abdomen was found 2.5 cm. above the fifth cell and 4 cm. away from apex of the burrow. The open burrow led diagonally 7.5 cm. to the surface. Below this depth the main burrow and side burrows were filled, although they could be partially traced by the somewhat loose soil in the burrow. All of the spiders were placed in the salve cans to be reared.

On May 16th (no. 405), at McLean I found a nest at the foot of a hill near Mud Pond. Although there appeared to be only one cell, digging the nest out was very tedious. There were at least

three roots, 2.5 cm. in diameter and several stones and pebbles adhering tightly to the clay soil. The open burrow went 5 cm. deep into the ground; then it curved, twisted between roots and stones to a depth of 20 cm. The cell contained a spider with an egg on its abdomen found 2.5 cm. away from the end of burrow. At the same locality on June 2nd, another nest was discovered (no. 407) at the

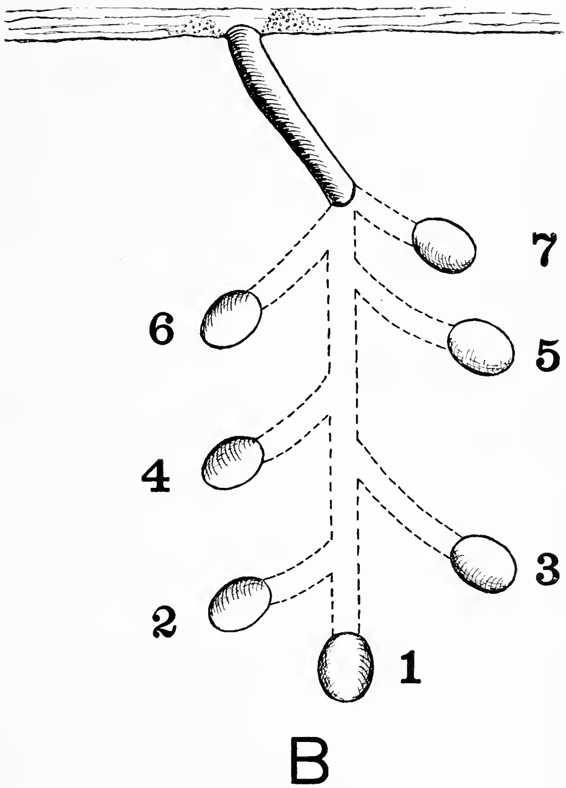


Fig. B—Nest (no. 404) of *Priocnemis minorata* with seven cells.

summit of a rolling hill near Mud Pond. The burrow extended diagonally 6.5 cm. to a blind end with hardly any roots or pebbles. Below this were found six cells, closely arranged more or less spirally in ascending order, suggesting a bunch of grapes hanging from a stem. I found four cocoons, one to each cell in the first four cells from the bottom. In the fifth cell there was a small larva feeding on the spider's abdomen; and in the topmost cell, the sixth,

a spider with an egg on its abdomen. Both spiders were *Wadotes hybridus*.

Five additional nests were dug out at Bull Pasture Pond. Number 406 contained a single cell at a depth of 12.5 cm. Number 403 was open down to a depth of 19 cm.; two cells were found, one at a depth of 22.5 cm. and another at a depth of 27.5 cm. The former contained a spider which for some reason had no egg on it; the latter contained a small larva. Nest no. 409 contained two cells; number 408 contained four cells and no. 410 contained five cells. In general, the arrangement was similar to that described and figured for nest no. 404, except for modification to avoid roots and stones.

The eight nests dug out varied in depth from 12.5 to 27.5 cm., measured from the surface to the deepest cell. The cells were ordinarily spaced from 2.5 to 4 cm. above one another in various directions off the main burrow. This is suggestive of a vegetative twig of a woody plant with alternate leaves placed upside down; the leaf blades could be imagined as the number of cells. The cells are nearly uniformly $2 \times 1.5 \times 1$ cm. in size. Each time the female wasp completes a cell, she plugs with earth the burrow extending from the main shaft to the base of the cell, this burrow being usually about 2.5 cm. in length.

If the female wasp was fortunate enough to select a nesting spot with few roots and stones beneath the ground, the number of cells found per nest was probably more or less directly related to the time required to construct a cell. In cases where many obstacles were in the way of nesting, the burrow was constructed so as to avoid stones and roots (nos. 403, 405, 406, 409); these examples generally had a smaller number of cells, ranging from one to two per nest. In cases where there were less roots and stones in the ground, the maximum for one nest was five to seven cells. The top three inches of soil was dark loam interlaced with roots, root hairs, and pebbles. Beneath the first layer of soil, the rest was largely pale clay-loam soil and large rocks. Occasionally roots of 3 to 8 cm. diameter were present. Whether a female utilizes one nest for the entire season or whether she constructs additional nests is unknown.

Immature Stages

The spider is almost always placed on its right side in the cell with the egg on top, attached latero-ventrally close to the base of the abdomen. The egg is about 1 mm. in diameter and 3 mm. long;

it is opal white and slightly curved in the middle (fig. A). The eggs on the spider prey were reared in salve cans in the laboratory where the average room temperature was 75° F. In about forty-eight hours, under these conditions, the egg hatches into a tiny larva. The young larva feeds on the body fluid of the spider in the same position as the egg was laid for three or four days, and by then has consumed the spider's abdomen. By this time, the mandibles are apparently strong enough to consume the body of the spider, and the larva feeds upon the cephalothorax. At room temperature a total of five to six days are required for the larva to devour the entire spider. After finishing the spider, the larva starts to spin its cocoon. The silk is first attached from wall to wall of the cell, then is gradually spun into an oval cocoon occupying the center of the cell and enclosing the larva. Under the much cooler temperature of the nest in the soil, development is undoubtedly much slower. From a total of fifteen attempted rearings, only six of the eggs were reared through the larval stage. The other nine were attacked by mold and nematodes on the egg as well as on the young larvae. Four last instar larvae were placed in preservative fluid to be described later. Several spiders on which the egg or larva had died were kept to find the duration of paralysis of the spider. The spiders survived without food for 17 days (smaller species) to 33 days (larger species) before dying. They showed no signs of recovery from paralysis.

The cocoon is a brown, oblong ovate pouch, held by many fine silk threads to the walls of the cell. Four cocoons have been kept from June, 1953 until Dec., 1953, and as yet no adults have emerged. There is no evidence that this species has more than one generation a year.

Discussion

In a number of ways, *Priocnemis* (*Priocnemis*) *minorata* is rather strikingly different from most other native Pompilidae. It is an early spring species and occurring in woodlands and nesting in heavy clay-loam soil often containing many roots and stones. The nests are constructed beneath fallen leaves and are very difficult to detect unless one follows the female wasp with her prey to the nest. The female wasp always proceeds backward in a straight line to her nest with the spider, without making exploratory trips like *P. cornica*.

The nests were always found to be open and contained from one to seven cells. The preparation of several cells per nest is a most

unusual trait for a Pompilidae. It has never been described for a North American species; however, the present writer, H. E. Evans, and C. S. Lin have found that, in two widely separated localities, *Priocnemis* (*Myrmecosalius*) *cornica* (Say) prepares up to seven cells to a nest (unpublished observations). However, *P. cornica* utilizes mostly ready-made holes such as abandoned tiger beetle holes. Adlerz (1903, 1912) in Sweden found *Priocnemis exaltatus* (Fab.) closing a lateral cell of the gallery of the nest. While digging out the nest, he also found nearby two other enclosed cells previously stored with prey. In France, Soyer (1939) made many observations on *Priocnemis propinquus* (Lep.) which utilizes other animal burrows and constructs several lateral cells. The burrow is left open during each nesting. In Chile, Claude-Joseph (1930) also made some observations on four species of the genus *Salius* (= *Priocnemioides*). One of these, *Salius flavipes* Guer. nests in abandoned lizard, grasshopper, and cricket burrows; several lateral cells are constructed with the entrance kept opened between nesting. *S. dumosus* Guer., *S. hirticeps* Guer. and *S. dispertitus* Kohl similarly construct several cells to a nest. Therefore it appears that the habit of preparing several cells for a single gallery occurs in several species of *Priocnemis* and also in certain related genera.

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CONCERNING TYPE LOCALITY AND TYPE FIXATION OF THE NORTH AMERICAN ANT, MYRMICA EMERYANA FOREL.

By Marion R. Smith,[1] Washington, D.C.

This ant was originally described by Forel as *Myrmica scabri-*

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nodis Nyl. r. *Schenki* var. *emeryana* in 1914, Deut. Ent. Ztschr., Heft VI, p. 617–618 from all castes, the description being largely based on a comparison of these castes with the European, *M. schencki* Em. to which Forel thought it closely related. With respect to locality or localities from which the new form came Forel stated, "I have myself, many times collected the variety *emeryana,* especially in North Carolina. Earlier I had erroneously determined it as *fracticornis* Em." (author's translation). Forel's brief and rather unsatisfactory description plus his failure to cite a specific type locality has caused much confusion concerning the taxonomy of *emeryana.* Weber in his Revision of *Myrmica,* 1948, Ann. Ent. Soc. Amer. 41 : 298–301 treated the ant as a subspecies of *schencki,* giving synonyms, descriptions of all castes, distribution and biology as well as figures of certain structures of the worker and male. With reference to type locality he remarked, "Not specified but probably including North Carolina which is mentioned in the original description. Washington, D. C. specimens in the Wheeler collection were labeled as cotypes." Creighton, 1950, in his Ants of North America, Harvard University, Mus. Comp. Zool. Bul. 104, p. 98 treats *emeryana* as a species commenting as follows, "Although this inseet is closely related to the European *schenki* I believe that it is better to treat it as a separate species, at least until the relationship of the American forms to those of Europe is placed on a sounder basis than exists at present." He gave the distribution as "Newfoundland to Georgia and west to the Rocky Mountains. The western records are comparatively rare." With respect to type locality Creighton stated: "No definite locality cited, by inference from North Carolina. There are no cotypes in this country."

Wishing to obtain cotypes as well as detailed information concerning its collection I wrote to Dr. H. Kutter (a former protege of Forel's), Flawil, St. Gallen, Switzerland. Not only had Dr. Kutter received directly from Forel the gift of numerous authentically determined species but also cotypes of many of Forel's own species. In response Dr. Kutter very kindly sent me a cotype worker and winged female, all mounted on a single pin to which was attached three labels:

cotypus (printed label)

M. scabrinodis Schenki Em., Pied Mt. Mitchell, Tyson, "3400," ♀, N. C., 21 VII (handwritten label)

r. Schenki Em., v. Emeryana For. (handwritten label)

His letter concerning these specimens and other information I

have translated as follows: "Forel wrote in connection with the original description of *M. emeryana* that he had at first erroneously determined the ant as *fracticornis* Em. On the ants I gave you, the first label is Forel's, the second label, r. *Schenki* Em. var. *emeryana* Forel was added later by his secretary, Fräulein Schenkel. The ants were determined however by Forel and came from his collection. I still have 8 individuals from the collection of Forel, 3 females, 2 males, 3 workers. Of these, 7 are designated as cotypes. They all came from North Carolina, indeed from Mt. Mitchell at a height of 3,400 feet on July 21 (year not specified). Several of my specimens still have in common other labels. They were at first designated as *scabrinodis* var. *sabuleti,* then as *schenki,* then as *fracticornis* and still finally as *emeryana,* all by Forel. . . ."

One can obtain further information concerning "Tyson" by examining Forel's remarks in his descriptions of several new species of ants from North Carolina (1901, Ann. Soc. Ent. Belg. 45: 348–351). Under *Pheidole tysoni,* for instance, Forel stated, "I have collected this species above 1,000 meters near the farm of M. Tyson at the foot of Mt. Mitchell in North Carolina, the 20th of July."

Under *Ph. morrisii* var. *vanceae* he remarked, ". . . 19th of July 1899." By inference one can therefore assume that *M. emeryana* was collected on or near the farm of a Mr. Tyson at the foot of Mt. Mitchell at an altitude of 3,400 feet on July 21, 1899 by Forel himself.

That the ant greatly confused Forel can easily be seen by Kutter's remarks as to the different labels Forel had attached to specimens before he finally described the individuals as *emeryana.* In a recent paper on Studies of New Mexico Ants, Cole (1953, Jour. Tenn. Acad. Sci. 28: 243) has this to say concerning *emeryana.* "Although there is considerable doubt in my mind as to the validity of this species I collected many series which would appear to match the characteristics of *emeryana* very closely."

With facts as stated above I therefore restrict the type locality of *Myrmica emeryana* Forel to the vicinity of Tyson's farm, altitude 3,400, foot of Mount Mitchell, North Carolina. I also have chosen as a lectotype the worker mentioned above which has been sent to Dr. H. Kutter for placement in the Forel collection at the Museum of Natural History in Geneva, Switzerland.

CONTENTS

(Arranged alphabetically throughout)

Coleoptera

Diptera

General Subject

Heteroptera

Homoptera

Hymenoptera

LEPIDOPTERA

OTHER ORDERS AND OTHER ANIMALS

INDEX TO VOLUME XLIX

Arranged alphabetically throughout; valid species in Roman type, new species and other forms in **boldface.** ø indicates other animals; * plants. Not included in this index, extensive lists of wasps on pages 1–7 and aphids on pages 8–11.

Number of New Forms in this Index—39

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